MAYFLY ECOLOGY

# Rathcoole Woodlands

## Freshwater Ecology Survey

Version number 2

07/11/2024

Local Authority Waters Programme

vibrant communities | catchment assessment | healthy waters

**Table of Contents**

| Acronym/ term | Definition |
|---|---|
| **AFA** | Area for Action. These are areas where it has been identified that specific measures are required to deliver the objectives of the Water Framework Directive. The areas were chosen during the EPAs catchment characterisation process as well as input from various stakeholders. They are divided into three sub-categories: area for protection, area for restoration or area for catchment project. |
| **BoCCI** | Birds of Conservation Concern Ireland 2020 -2026. This is a list of bird species in Ireland which are either red listed (high conservation concern) or amber listed (medium conservation concern). Please see Gilbert et. al., (2021) or https://birdwatchireland.ie/birds-of-conservation-concern-in-ireland/ for further information. |
| **CPUE** | Catch Per Unit Effort. This is the result reported following a crayfish survey to summarise the population density. |
| **d/s** | Downstream |
| **EPA** | Environmental Protection Agency |
| **European site** | Special Areas of Conservation (SAC) and Special Protection Areas (SPA) are sites of European importance which have been designated under European legislation. Collectively they are referred to as European sites. SACs were designated under the Habitats Directive for habitats and species (but not including bird species). The Birds Directive protects all wild birds and their nests, eggs and habitats within the European Union. SPAs are classified under the Birds Directive to protect birds that are rare or vulnerable in Europe as well as all migratory birds that are regular visitors. |
| **IFI** | Inland Fisheries Ireland |
| **LAWPRO** | Local Authority Waters Programme |
| **Left bank/ right bank** | If standing in the water facing downstream the bank to the left is referred to as the left bank. |
| **NBDC** | National Biodiversity Data Centre |
| **NPWS** | National Parks and Wildlife Service |
| **OSI** | Ordnance Survey Ireland |
| **Riparian zone** | An area of vegetation which acts as the interface between terrestrial and river ecosystems. These zones are important in providing bank stability, flood attenuation, habitats for range of species and water quality management but also as green spaces for people. |
| **River birds** | This is a term used to describe birds that are strongly associated with rivers and streams. In this report the term mainly refers to dipper, grey wagtail and kingfisher. |
| **Rhizomes** | Some plants have modified underground stems that send out roots and shoots e.g., Japanese knotweed. |
| **SDCC** | South Dublin County Council |
| **Third Schedule Invasive Species** | This is a list of invasive species appearing on the third schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 [S.I.477/2011]. The regulations prohibit the planting, dispersal or allowing to disperse or spread or causing to grow of any plant listed within the third schedule. |
| **u/s** | Upstream |
| **WFD** | Water Framework Directive |

Please cite this report as;

Mayfly Ecology (2024). Freshwater Ecology Survey of Rathcoole Woodlands, Co. Dublin. Unpublished report for the Four Districts Woodland Habitat Group, 2024.

The following report was prepared under funding from the Local Authority Waters Programme.

Local Authority Waters Programme

vibrant communities | catchment assessment | healthy waters

# 1. INTRODUCTION

## 1.1. Background

Mayfly Ecology was commissioned by the Four Districts Woodland Habitat Group to undertake a freshwater ecology survey of the streams flowing through Rathcoole Woodlands. The survey included kick sampling for macroinvertebrates and a white-clawed crayfish survey.

The purpose of the survey was to understand the macroinvertebrate quality of the streams within the woodland and assess whether white-clawed crayfish are present. This project was funded by the Local Authority Waters Programme (LAWPRO) and all survey work and reporting were undertaken by Letizia Cocchiglia of Mayfly Ecology.

Other ecological surveys have been conducted in Rathcoole Woodlands by various consultants and the reports have been made available to the public on the Rathcoole Woodlands website http://rathcoolewoodlands.org/ .

## 1.2. Location and Description of the Site

Rathcoole Woodlands is located in Rathcoole, Co. Dublin. The north of the woodlands is bounded by suburban housing, while to the south and southwest the woodland is surrounded by agricultural fields. To the east Rathcoole Park adjoins the woodland. **Figure 1-1** below shows a map of the location of Rathcoole Woodlands.


**Figure 1-1: Map showing the location of Rathcoole Woodlands. Site boundary is indicative only.**

In the early 1990's South Dublin County Council (SDCC) purchased lands in Rathcoole with the intention of developing the site and providing an amenity area. Part of these lands had little human intervention for the past 30 years. The land began to regenerate, and a mosaic of habitats developed forming what is known today as the Rathcoole Woodlands.

The main habitat present is wet woodland and in a specialist survey this was confirmed as being Annex I priority habitat Alluvial Woodland (91E0) (Hodd, 2021). In the same survey two other Annex I habitats were also confirmed, Lowland hay meadows (6510) and Petrifying springs (7220). Previous reports highlighted tall herb vegetation within the woodlands and the potential of this being a fourth Annex I habitat, Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels (6430) (Wilson & Denyer 2021). In 2023, a small area in the northwestern corner of the site was confirmed as this Annex I habitat (Hodd, 2023). Other habitats present include immature woodland, scrub and grasslands (Hodd, 2021).

The Camac River flows along the eastern boundary of Rathcoole Park. Two small streams which are tributaries of the Camac flow through Rathcoole Woodlands. The streams are not named on Ordnance Survey Ireland (OSI) mapping but are named on the Environmental Protection Agencies (EPA) mapping website. For consistency the naming system that EPA mapping have assigned is used in this report. This also matches the names used in SDCC information reports to help avoid confusion.

The Crockshane (also named the Slade or Rathcoole) flows along the south-eastern boundary of the woodlands designating the townland boundary between Rathcoole and Coolmine. Historic 25" mapping (surveyed 1909, published 1910) shows that the Crockshane was fed by the Coolmine and a small tributary called the Slade. EPA river mapping and current OSI discovery maps still show this river layout however Wilson & Denyer (2021) noted that this section had only standing water and no flow after heavy rainfall in June 2021. In 2022 this section was again assessed as part of a hydrology report and it was confirmed that the connection with the Coolmine no longer exists and the channel here is now a dry ditch (Envirologic, 2022). The Crockshane is now only fed by the Slade which rises approximately 750m-1.2km south of the woodland. The Crockshane enters the Camac in Rathcoole Park just upstream of the metal bridge.

The Coolmine (or Fitzmaurice stream) flows through the centre of the woodland in a north-eastern direction dividing the woodland in two. Historic 6" mapping (surveyed 1837, published 1941) shows this stream as rising just outside the most southerly boundary of the Rathcoole Woodlands. Today its flow can be traced using aerial imagery as rising approximately 650m south-west of the woodland boundary near the Coolmine Equestrian Centre. After flowing through the woodland, the Coolmine enters Rathcoole Park. The mapped course the stream takes here now appears to be a dry ditch. Instead, the stream has been modified into a series of ponds and weirs just beside the ditch. Outside the park the river is diverted underground and it is presumed that it enters the Camac under the N7. Both the Crockshane and Coolmine streams have been quite modified as evidenced from historical mapping where a series of drainage ditches have been dug perpendicular to the streams. Most of these ditches are now dry.

The Crockshane and Coolmine are tributaries of the Camac. The Camac rises in a coniferous plantation on the western flank of Knockannavea Hill before skirting around the boundary of the Brittas Ponds. It then flows in a northerly direction following the N81 and Slade Road and then enters the Rathcoole Park flowing along the boundary of the park. It passes under the N7 and flows through Baldonnell and Corkagh Park. From Corkagh Park is flows through an urban landscape passing through Clondalkin, under the M50 and then through Bluebell, Inchicore and Rathfarnham before entering the Liffey at Heston station. While the upper reaches are characterised by agricultural lands the middle on lower reaches of this river are heavily urbanised.

Two ponds are located just to the east of Rathcoole Park beside Drury Mills and Millrace housing estates. They are referred to as the Switfbrook Millponds east and west in this report. Swiftbrook Millpond (east) is a narrow linear pond constructed to serve the Swiftbrook Mill and it appears on the first edition of

historic 6" mapping. Swiftbrook Millpond (west) appears to have been constructed later as it does not appear on 6" or 25" mapping but it is unclear when the pond was built. Aerial imagery from 1996 shows an outline of the two ponds but they appear to have dried up. In around 2009 the west pond was re-dug and in 2013 the eastern pond was re-dug as part of housing development construction works (Google earth historic imagery). The Swiftbrook Millpond (east) is fed by the Camac Millrace water from the pond then outflows to Swiftbrook Millpond (west). Finally, water discharges back into the Camac River. **Figure 1-2** shows a map of the rivers and ponds discussed.

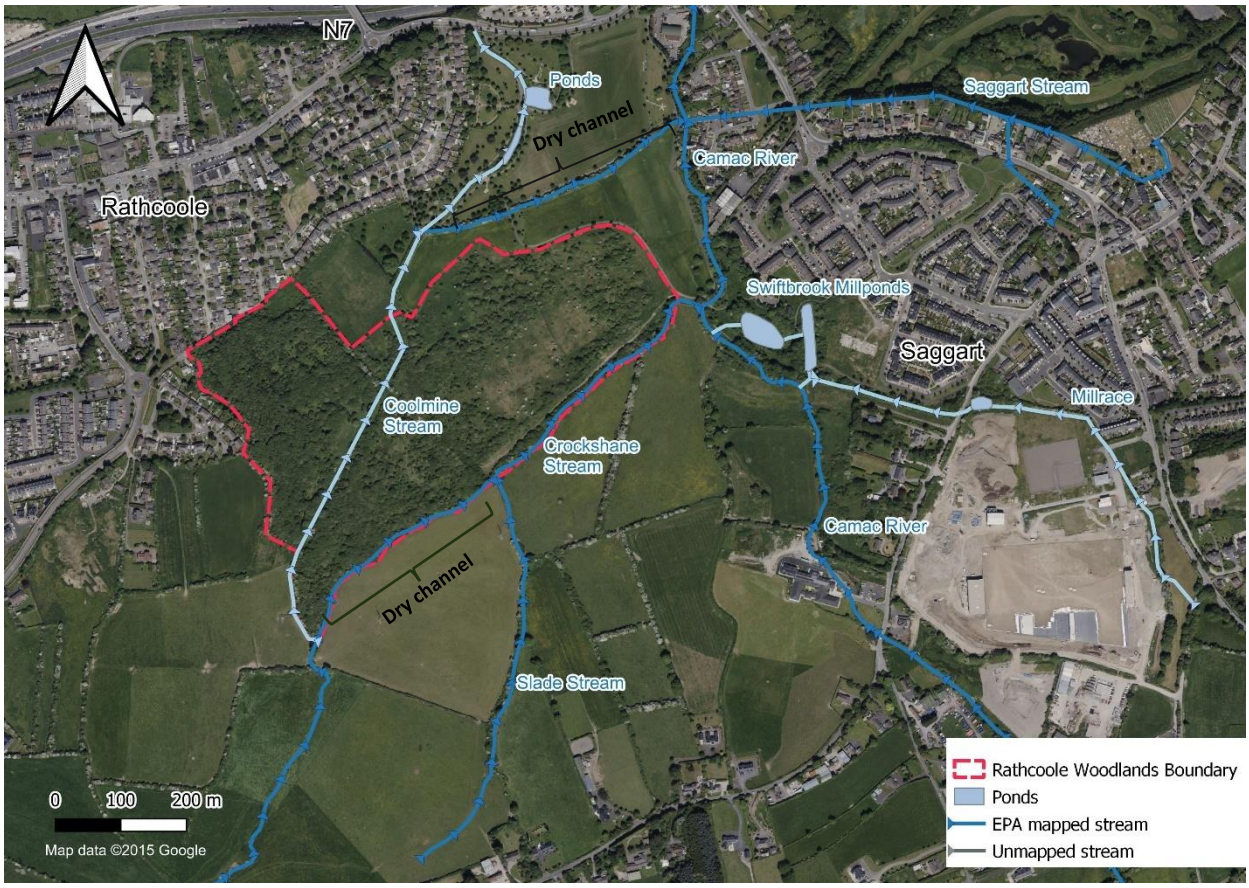


**Figure 1-2: Map showing the location of the rivers and ponds within and adjacent to Rathcoole Woodlands. Site boundary is indicative only.**

# 2. METHODOLOGY

## 2.1. Desktop Review

A desktop review was completed to gather baseline water quality and ecological information for the Camac River and its tributaries flowing through Rathcoole Woodland. The review included a search of current Water Framework Directive (WFD) status and summary of EPA macroinvertebrate monitoring results.

The review also included a search of records for protected aquatic species which are listed on Annex II of the EU Habitats Directive (92/43/EEC) such as; Atlantic salmon (*Salmo salar*), river lamprey (*Lampetra fluviatilis*), brook lamprey (*Lampetra planeri*), sea lamprey (*Petromyzon marinus*), freshwater pearl mussel (*Margaritifera margaritifera*) and white-clawed crayfish (*Austropotamobius pallipes*) as applicable. Otter (*Lutra lutra*) was included in the search too.

Records for any other fish species were also noted. For example, European eel (*Anguilla anguilla*) is not listed on Annex II of the Habitats Directive but numbers of juvenile eel reaching coastlines of Europe have undergone significant declines and it has now been classed as critically endangered on the IUCN Red List of Threatened Species.

The desktop review included a search for any aquatic/ riparian habitats listed on Annex I of the Habitats Directive such as 3260 Water courses of plain to montane levels with the *Ranunculion fluitantis;* and *Callitricho-Batrachion* vegetation or aquatic mosses. It also included a search of any aquatic plants under the Flora Protection Order (S.I 235, 2022).

The characterisation process for the 3rd Cycle River Basin Management Plan (RBMP 2022-2027) has been completed and the report for this catchment was reviewed and is summarised in the results. In addition, the RBMP was consulted to assess if the rivers within the study site fall into an Area for Action (AFA). As part of the current RBMP (2022-2027) certain areas were identified where measures are needed to achieve the objectives of the WFD. These areas are termed Areas for Action. There were selected based on the priorities in the RBMP, evidence from the EPAs characterisation process, and the expertise, data and knowledge of public body staff with responsibilities for water and the different pressure types. AFAs are categorised into areas for protection, restoration or catchment project.

The following is a non-exhaustive list of sources consulted to conduct the desktop review.

- Environmental Protection Agency (EPA) online mapping tools (https://gis.epa.ie/EPAMaps) and (https://www.catchments.ie/maps/ ) for water body information and mapping;
- Environmental Protection Agency (EPA) catchment characterisation report. Available online (https://www.catchments.ie/wfd-cycle-3-catchment-assessments-published-by-the-epa/);
- Water Action Plan: River Basin Management Plan 2022-2027. Available online (https://www.gov.ie/en/policy-information/8da54-river-basin-management-plan-2022-2027/ )
- Inland Fisheries Ireland online mapping tool (https://opendata-ifigis.hub.arcgis.com/ );
- National Parks and Wildlife (NPWS) website for Conservation Objectives, Site Synopsis and any other relevant reporting for European sites (https://www.npws.ie/protected-sites);
- NPWS online mapping and data resources for latest European site boundaries and relevant species/habitat mapping (https://www.npws.ie/maps-and-data);
- NPWS published report regarding conservation status of habitats and species in Ireland protected under the Habitats Directive (NPWS 2019a, 2019b and 2019c);
- National Biodiversity Data Centre (NBDC) online mapping tool for distribution records of protected species or invasive species (https://maps.biodiversityireland.ie/Map);
- Geohive online Environmental Sensitivity Mapping tool (https://airomaps.geohive.ie/ESM/);
- Any local surveys of flora, fauna and habitat available using the Heritage Councils mapping website (https://heritagemaps.ie/WebApps/HeritageMaps/index.html).

## 2.2. Field Survey Methodology

A freshwater survey was conducted within the Crockshane, Coolmine and Camac rivers on the 7th and 8th of August and crayfish trapping was conducted on the 27th of September. At each sample location the river was walked at least 100m up and downstream of the access point to gain an understanding of habitats. The following information was collected during the survey and detailed methodology for each is given in the sections below.

- General habitat survey
- Macroinvertebrate kick sampling
- White-clawed crayfish survey
- Invasive species observations
- Other species/ features of note

**Table 2-1** below gives the GPS coordinates for each survey site and type of survey carried out**. Figure 2-1** shows a map of the sampling locations.

**Table 2-1: Coordinates for each site surveyed**

| Site name | GPS coordinate (lat/long) | Survey |
|---|---|---|
| Site 1- Crockshane Stream | 53.27771, -6.45845 | Macroinvertebrate & Crayfish |
| Site 2 – Coolmine Stream in woodlands | 53.27666, -6.46344 | Macroinvertebrate & Crayfish |
| Site 3 – Coolmine Stream in park | 53.28056, -6.46084 | Macroinvertebrate & Crayfish |
| Site 4 - Camac River d/s metal bridge | 53.28027, -6.45410 | Macroinvertebrate & Crayfish |
| Site 5 – Camac River near weir | 53.27908, -6.45361 | Crayfish survey only |
| Site 6 – Camac at Slade Road Br. | 53.27505, -6.45040 | Crayfish survey only |
| Site 7 – Swiftbrook Millpond (east) | 53.27910, -6.45187 | Crayfish trapping only |

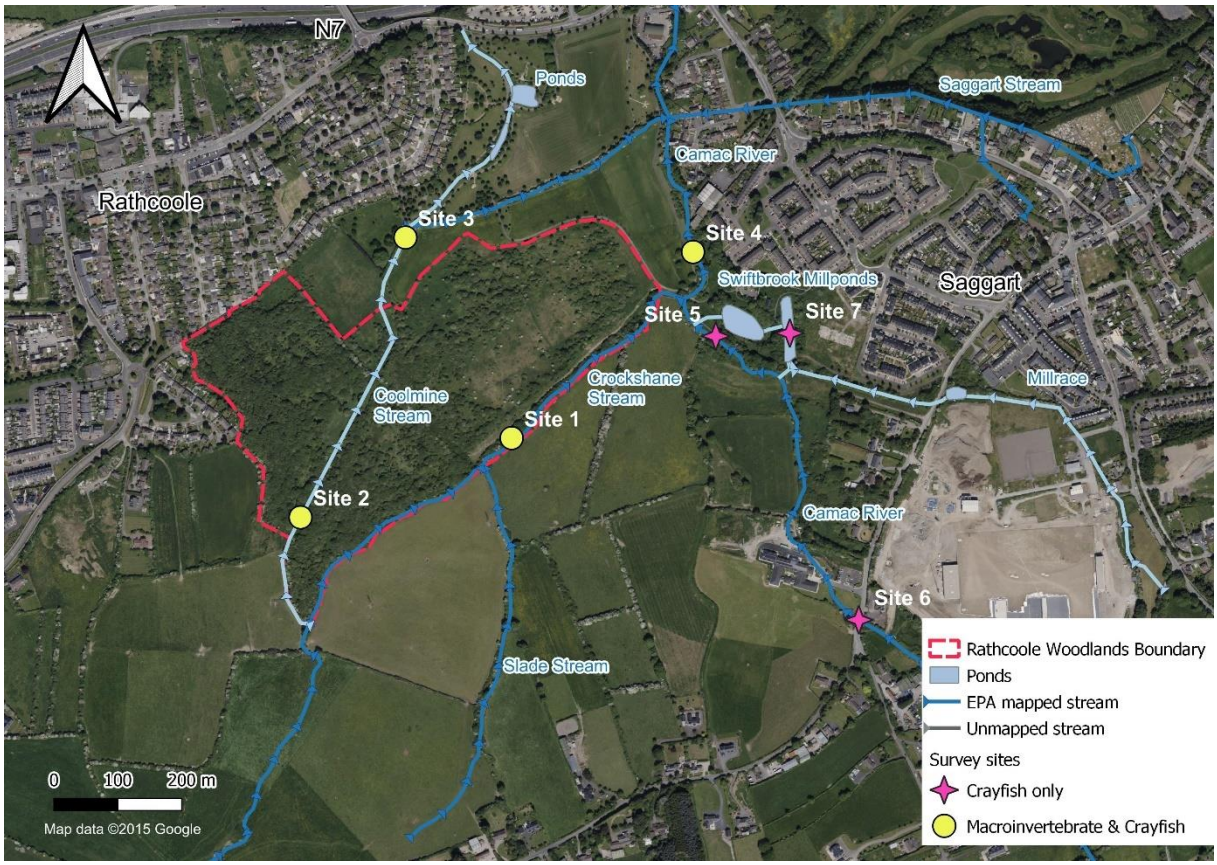


**Figure 2-1: Map showing the location of the survey sites and type of survey indicated. Rathcoole Woodlands Boundary is indicative only.**

### *2.2.1. General river habitat characteristics*

At each sampling location the general river habitat characteristics were recorded and included;

- Substrate type, degree of overlying sediment and note of sediment generated when substrate disturbed.
- Flow conditions and velocity.
- Riparian zone structure which includes a list of the dominant bankside vegetation and degree of shading along the river.
- Any aquatic macrophytes observed were recorded and percentage cover noted. This included submerged/ emergent plants and those growing along the bankside.
- General hydromorphological characteristics including; river depth, width, bank height, signs of erosion or modification and barriers to connectivity.

In addition, handheld probes were used to record physico-chemical parameters in situ. Probes used included Oxygaurd Handy Polaris and Hanna Combo which were calibrated before use. Parameters measured included; dissolved oxygen (% and mg/l), pH (pH unit), temperature (°c) and conductivity (µS/cm).

### *2.2.2. Biological quality survey - Macroinvertebrates*

Macroinvertebrates were collected using a two-minute (or longer may be required in certain substrate conditions) kick sampling method with a standard hand net (0.5 mm mesh). The survey technique adhered to ISO Standard 10870:2012 and CEN FprEN 16150:2011 for kick sampling and utilised the EPAs standard protocol. Stone washing (1 minute) was also undertaken to ensure collection of species which cling to rock surfaces. The collected sample was tipped into a white tray and macroinvertebrates identified in the field to the lowest taxonomic level possible.

Q-values were assigned as per EPA published guidance (McGarrigle et al., 2002, Toner et al., 2005) with the surveyor taking into account river typology, seasonality and habitat conditions as per EPA guidance. The information collected during the general river habitat characteristic survey was used to inform Q-value assignment. The Q-value is based on macroinvertebrate sensitivity to pollution with Group A taxa being the most sensitive and Group E taxa being the most tolerant.

Group A – Sensitive
Group B – Less sensitive
Group C – Tolerant
Group D – Very tolerant
Group E – Most tolerant

The Q-value mainly reflects the effects of organic pollution (i.e., deoxygenation and eutrophication) but where a toxic effect is apparent or suspected the suffix '0' is added to the biotic index (e.g., Q1/0, 2/0 or 3/0). An asterisk after the Q value (e.g., Q3*) indicates heavy siltation of the substratum.

The macroinvertebrate survey for this report was conducted in August. The Q-value is usually applied in summer/autumn when anthropogenic pressures are greatest on macroinvertebrates due to lower flows and higher temperature. When sampling out of this season adjustments to the Q-value assessment need to be applied.

**Table 2-2: Relationship between the Q-value and water quality (Table adapted from EPA river quality survey reports).**

| Q-value | Biological Quality[1] | Pollution Status | Condition |
|---|---|---|---|
| Q5, Q4-5 | High | Unpolluted | Satisfactory |
| Q4 | Good | Unpolluted | Satisfactory |
| Q3-4 | Moderate | Slightly polluted | Unsatisfactory |
| Q3, Q2-3 | Poor | Moderately polluted | Unsatisfactory |
| Q2, Q1-2, Q1 | Bad | Seriously polluted | Unsatisfactory |

### *2.2.3. White-clawed crayfish survey*

The white-clawed crayfish (*Austopotamobius pallipes*) is Irelands only native freshwater crayfish. It is found in freshwater lakes, ponds, streams and rivers with a limestone influence. While it can be locally abundant the species is largely restricted to areas with an underlying carboniferous limestone geology. The species is protected under the Wildlife Act (1976 as amended) and Annex I and Annex V of the European Habitats Directive (92/43/EEC). In a European context Ireland contains important populations of this species but unfortunately it is under threat from crayfish plague (*Aphanomyces astaci*). This disease can quickly work through a river system and can result in a 100% mortality rate. Crayfish plague has now been detected in most of the major Irish river systems containing crayfish. While this disease can be spread by non-native crayfish it is thought the disease came into Ireland via contaminated equipment. Other threats include the introduction of non-native crayfish which can outcompete the native species and carry diseases. To this date only one population of non-native crayfish, the common yabby (*Cherax destructor*), has been identified and it appears to be restricted to an artificial lake in Mallow, Co. Cork (Sweeney et al., 2022).

A white-clawed crayfish survey was conducted at Sites 1-7 under licence from the NPWS (Licence no. C135/2024 for hand search and Licence no. C194/2024 for crayfish trapping). At Sites 1-6 a standard hand search methodology was applied using a bathyscope. Site 7 is the Swiftbrook Millpond and crayfish trapping was conducted here. Survey followed the methodology and guidance within Peay (2003), O'Connor et al., (2009) and Reynolds et al., (2010).

In summary, the hand search method involves surveying a 100m section of river (can be up to 400m as required). Within this section five patches of habitat that appear to be favourable for crayfish and can be physically searched are chosen. A search is made of 10 potential refuges in each habitat patch. The aim is to find relatively stable, individual refuges that have the highest probability of being used by crayfish (Peay, 2003). The relative abundance of crayfish is defined as the average number of crayfish per 10 refuges searched or Catch Per Unit Effort (CPUE). For the trapping survey, five Swedish crayfish traps were deployed along the pond margins. Traps were baited with cat food (fish based) placed in a bait chamber and left for 24hours. The use of traps does have its limitations and are most efficient where there are dense population of crayfish but can be useful in areas that are inaccessible.

Details are recorded of the environmental conditions at the time of survey and the features of each patch surveyed that are most relevant to crayfish. Suitable refuges include boulders (>25cm) or large cobbles (15-25cm) but can also include; logs, debris, margins next to favourable bankside habitat natural crevices, undercut banks and large tree roots.

Strict biosecurity protocols were employed during the survey, please see **Section 2.3**.

[1] The Q-value has been developed for rivers only. It does not equate to WFD Status however, in Ireland it is often the driving element in status assignment. It is the most common biological index that is used to calculate Ecological Status for rivers. The other biological indicator used in rivers is fish and monitored by Inland Fisheries Ireland.

### *2.2.4. Invasive species survey*

Any invasive aquatic or riparian plants listed on the Third schedule of the EC (Birds and Natural Habitats) Regulations 2011 (S.I.477/2011) were noted. Should any invasive plant species be present disturbance of the area is avoided.

## 2.3. Biosecurity

For all freshwater ecological surveys, the surveyor employs strict biosecurity methodology. The surveyor is familiar with invasive plant and animal species that occur in Ireland and before any site is visited a review of any aquatic or terrestrial invasive species records is conducted using the National Biodiversity Data Centres (NBDC) online mapping tool to assist in biosecurity planning. Once on site, should any invasive plant species be present their location is recorded and disturbance of the area avoided. The surveyor has completed "Better Biosecurity" online training course run by the University of Leeds.

The surveyor employs the Check – Clean – Dry protocol as recommended by Inland Fisheries Ireland. Before leaving the sampling site all equipment (waders, nets, buckets, trays etc) are checked and any visible debris removed. Equipment is then cleaned using a solution approved for use near water and recommended dosage (e.g., Virkon® Aquatic or Milton bleach). All equipment is allowed to dry thoroughly before reuse. In certain cases, a second set of clean equipment may be used if moving between catchments on the same day.

The surveyor will start in the upper reaches to avoid transmission of any invasive species in an upstream direction. The surveyor is aware of the current outbreak of crayfish plague (*Aphanomyces astaci*) which is easily spread on contaminated equipment. All biosecurity measures were taken to prevent the spread of crayfish plague.

# 3. DESKTOP REVIEW RESULTS

## 3.1. Existing Water Quality

The Camac, Coolmine and Crockshane rivers are all part of the Liffey and Dublin Bay catchment, Hydrometric Area 09. A bedrock fault divides Rathcoole Park in two. The groundwater body (GWB) in the southern section which includes Rathcoole Woodlands is named the Kilcullen GWB. The groundwater body in the northern tip of the park is named the Dublin GWB. Both these GWBs are poorly productive i.e., they have limited storage capacity with shallow groundwater pathways. Geological Survey Ireland (GSI) have classified the underlying rock units in southern section of the park and woodland as Silurian metasediments and volcanics (non-calcareous). The rock unit in the northern tip of the park is Dinantian upper impure limestones (calcareous).

The Camac, Coolmine and Crockshane rivers are mapped by the EPA as being part of the Camac_020 waterbody. The EPAs national rivers programme monitors nearly 2,500 rivers in Ireland. In general, it is the main channels within a waterbody that are monitored as part of this programme. Small tributary streams such as the Coolmine or Crockshane are not monitored directly but the results of the main channel assessment are applied. In this case the Camac is monitored and for the Camac_020 waterbody the monitoring station (09C020250) is located approximately 3.2km downstream of Rathcoole Park. There is another station (09C020100) located approximately 630m upstream of the park on the Camac_010 waterbody.

Macroinvertebrates in the Camac River were last monitored by the EPA in 2022. Upstream of the park (station 09C020100) a Q3-4 was assigned indicating moderate macroinvertebrate quality. In the 1970's this station had recorded the highest macroinvertebrate quality (Q5) but has since undergone a decline. Improvements to a Q4 and even a Q4-5 have occurred, but it has not achieved a Q5 since 1977.

Downstream of the park (station 09C020250) conditions improve with Q4 assigned in 2022 which indicates good macroinvertebrate quality. This marks a big improvement compared to the poor and bad macroinvertebrate quality observed from the 1980's to the early 2000's with toxicity a suspected pressure at this station. It is the first time a Q4 has been achieved since monitoring began here in 1988. **Figure 3-1** summarises the historical and most recent Q-values for the Camac River.

**CAMAC** **09C02**

**Date Surveyed (last survey year only):** 21/06/22, 22/06/22

**Biological Quality Rating (Q Values)**

| Station Code | 1974 | 1977 | 1979 | 1981 | 1983 | 1984 | 1986 | 1987 | 1988 | 1989 | 1990 | 1991 | 1994 | 1996 | 1998 | 2002 | 2005 | 2007 | 2008 | 2010 | 2013 | 2016 | 2019 | 2022 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| RS09C020050 | | | | | | | 3-4 | | | | | | | | | | | | | | | | | |
| RS09C020100 | 5 | 5 | 4-5 | 4-5 | 3 | 4-5 | 3 | | 4 | | | 4 | | 4 | 3 | 3-4 | 3 | 4-5 | | 4 | 4 | 4 | 3 | 3-4 |
| RS09C020150 | | | | | | | | | 4 | | | 4-5 | | | | | | | | | | | | |
| RS09C020200 | 3 | 3 | 3-4 | 3-4 | 3 | 3 | 2-3 | | 2 | 2/0 | 2 | 2 | 2 | 2 | 2 | | | | | | | | | |
| RS09C020250 | | | | | | | | | 3 | 2/0 | 3 | 3 | | | | 2-3 | 3 | 3/0 | | 3-4 | 3-4 | 3-4 | 3-4 | 4 |
| RS09C020270 | | | | | | | | | 3 | | | | | | | | | | | | | | | |
| RS09C020300 | | | 1/0 | 1/0 | 3 | 3 | 1/0 | 3 | | | | | | | | | | | | | | | | |
| RS09C020310 | | | | | | | | | 2-3 | 2-3 | 3 | 3 | | 2-3 | 2-3 | 3 | 3 | 3 | | 3 | 3 | 3 | 3 | 3* |
| RS09C020400 | | | | 1/0 | 2/0 | 1 | 3 | 1 | 2-3 | 1 | 1 | 2 | 1 | 1 | 3 | | | | | | | | | |
| RS09C020500 | | | | 1/0 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 2/0 | 1/0 | 1-2 | 1-2 | 1 | 2/0 | 2 | 2-3 | 3/0 | 3 | 3 | 3 | 3 |

**Most Recent Assessment:**

In June 2022 poor ecological conditions continued at stations 0310 and 0500. Significant coverage of sewage fungus was noted at Station 0310 suggesting organic pollution upstream. Stations 0100 and 0250 both improved to moderate and good conditions, respectively. The improvements at station 0250 (Br SE of Baldonnell Ho) to good ecological quality is a first for this station since surveys started in 1988.

**Figure 3-1: Summary of EPA Q-value results in the Camac River since monitoring began in the 1970's. Monitoring stations are listed with the most upstream station listed first and the stations list works its way downstream. Active stations closest to Rathcoole Park are highlighted.**

**Table 3-1** below summarises the Water Framework Directive (WFD) status and risk of failing WFD objectives for the waterbodies closest to Rathcoole Woodlands and this is also mapped in **Figure 3-2** A WFD status (2016-2021) of Poor was assigned to the Camac_010 and Moderate to the Camac_020. Their WFD objective is to achieve at least Good Ecological Status and both waterbodies are considered to be "At Risk" of failing WFD objectives (3rd cycle risk).

The entire Camac River (waterbodies Camac_10 to 40) is designated as an AFA (Appendix 4 of the RBMP 2022-2027). There is a flood alleviation scheme proposed for the Camac and it was designated an AFA to pursue opportunistic river restoration improvements as co-benefits through appropriate steering of ongoing, planned and new non-WFD Projects across the Camac which includes the flood alleviation scheme. The streams in Rathcoole Woodlands would fall into this AFA.

**Table 3-1: Summary of WFD status (2016-2021).**

| Waterbody | WFD status (2016-2021) | WFD objective | Risk of failing objective | Significant pressure (if at risk) | Note |
|---|---|---|---|---|---|
| Camac_010 | Poor | Good | At Risk | Hydromophology, Invasive species | - The moderate macroinvertebrate quality (Q3-4) assigned in 2022 is not included in the 2016-2021 WFD status.<br>-Waterbody is an AFA |
| Camac_020 | Moderate | Good | At Risk | Urban runoff | -The good macroinvertebrate quality (Q4) assigned in 2022 is not included in the 2016-2021 WFD status.<br>-Waterbody is an AFA |
| Kicullen IE_EAG_003 | Good | Good | At Risk | Agriculture, Forestry and unknown (Chemical quality diminution for surface water, nutrients) | -Groundwater body |
| Dublin IE_EAG_008 | Good | Good | Review | n/a | -Groundwater body |

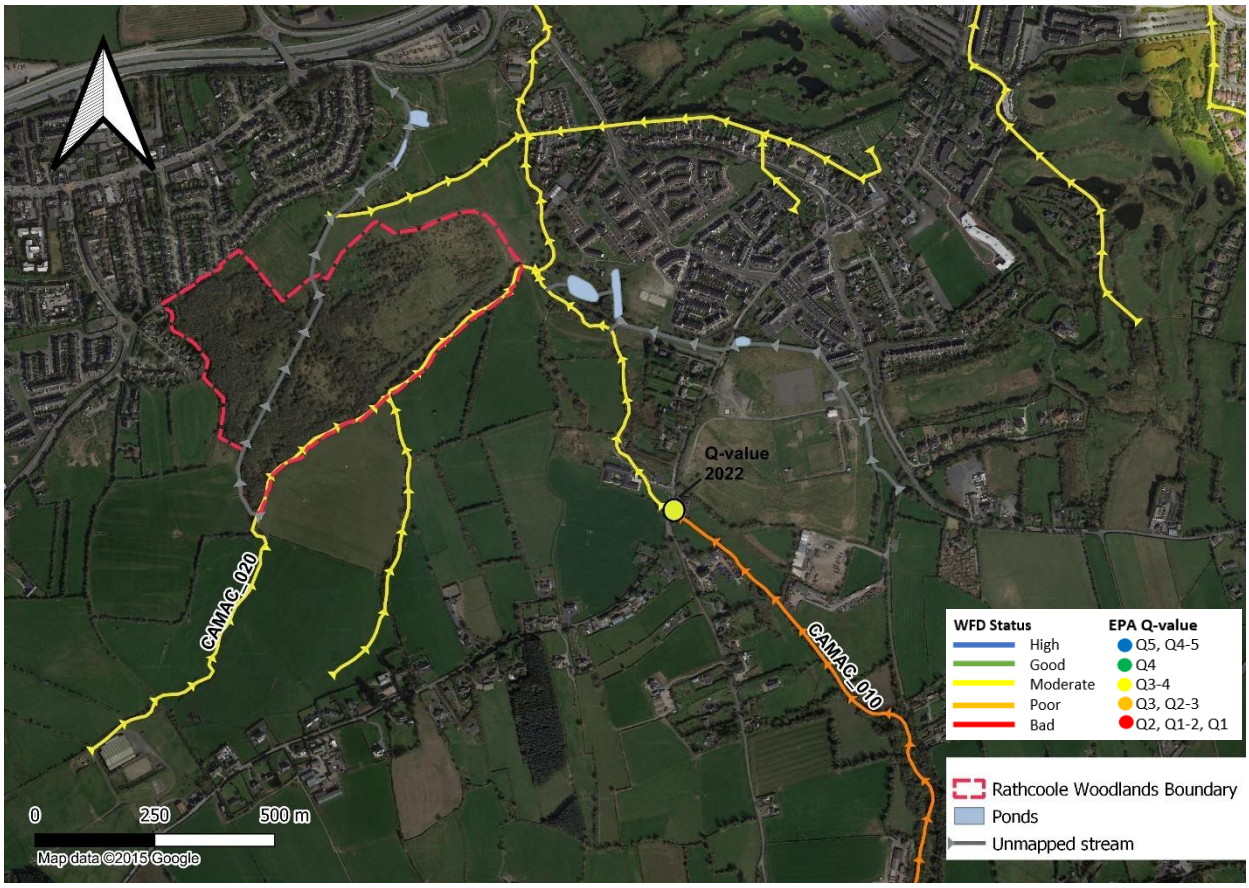


**Figure 3-2: WFD status (2016-2021) for the Camac (coloured lines) and the most recent Q-value (coloured circle) assigned to the station closest to the Rathcoole Woodlands. Rathcoole Woodland Boundary indicative only.**

## 3.2. Records of Protected Species and Habitats

The Coolmine or Crockshane streams are not located within any European Site, Natural Heritage Area, national park or any other protected site. The closest protected site is the Slade of Saggart and Crooksling Glen proposed Natural Heritage Area (pNHA Code 000211). This is located approximately 2km upstream of Rathcoole Park. The Coolmine and Crockshane are therefore not hydrologically connected to this pNHA.

This pNHA includes the Camac River and Brittas Ponds with a good example of a wooded river valley and a small wetland system. The Brittas Ponds are classed as a Wildfowl Sanctuary which support a variety of wildfowl, including teal, mallard, pochard and tufted duck. The ponds themselves are of interest for the aquatic plants they support, including Shoreweed (*Littorella uniflora*), a rare plant in Dublin and the marginal areas of freshwater marsh and wet grassland vegetation found.

Downstream of the Rathcoole Woodlands the closest hydrologically connected protected site is South Dublin Bay SAC (000210) and South Dublin Bay and River Tolka Estuary SPA (004024) both located approximately 23.2km downstream of the woodlands.

A summary of the desktop review for protected species and habitats is given below in **Table 3-2.** The available information for Rathcoole Woodlands was quite limited but please note that an absence of records does not necessarily mean a species or habitat is absent from the area. The Coolmine and Crockshane rivers are small streams which have not been extensively monitored or studied and is one reason why records are limited. The desktop search was for publicly available records online, other records may exist within private databases or private recorders. As is the case for a lot of small river habitats in Ireland, records are often reliant on keen eyed local members of public.

**Table 3-2: Summary of desktop review for protected aquatic species and habitats within or adjacent (1km) to Rathcoole Woodlands.**

| Species/Habitat | Designation[2] | Records |
|---|---|---|
| White-clawed crayfish | -Annex II & V of the EU Habitats Directive (92/43/EEC).<br><br>-Irish Wildlife Act (1976 as amended). | NBDC records of crayfish within the Camac River up and downstream of Rathcoole Park. These are records submitted by the EPA. The most recent records are from 2013, 630m upstream of the park at EPA monitoring station 09C010100 and 3.1km downstream of the park at station 09C010250.<br><br>More recently in 2023, dead crayfish (and brown trout) were observed in the Camac River just up and downstream of the weir (53.27855, -6.45199). IFI were notified and crayfish plague was excluded as the cause of mortality (pers. comm with observer of the incident) see **Plate 3-1.**<br><br>Good populations of crayfish have also been recorded in the Camac downstream of the N7 as far as the M50 in a 2018 study. In the same study crayfish were found in a small tributary of the Camac upstream of the N7 (pers. comm Pascal Sweeney).<br><br>In August 2023, a fish kill in a 3.5km stretch of the Camac (which included Rathcoole Park) was investigated by IFI. 250 dead white clawed crayfish were recorded and the incident was attributed to the accidental spillage of harmful material during the commissioning of a new water treatment plant. (Click link for **IFI press release**). |
| Otter (*Lutra lutra*) | -Annex II & IV of the EU Habitats Directive (92/43/EEC).<br><br>-Irish Wildlife Act (1976 as amended). | There are no records of otter on NBCD within Rathcoole Woodlands or Rathcoole Park. The closest records are from a 1980's otter survey by the Vincent Wildlife Trust. The presence of otter was recorded in the Camac approx. 3km downstream of Rathcoole Park (NBDC record 1980) and a further record in the Brittas Ponds 3.8km south of Rathcoole Park (NBDC record 1980).<br><br>More recently (2024) footage of an otter visiting a pond in a back garden has been shared on Rathcoole Woodlands facebook page. The exact location however could not be confirmed. An approximate location was given just north of the Mill and Slade crossroads. The closest waterbody here is a small tributary of the Camac named the Saggart stream and there are a number of large ponds within the adjacent golf course which may be supporting otter here. |
| Common frog (*Rana temporaria*) | -Annex V of the EU Habitats Directive (92/43/EEC).<br><br>-Irish Wildlife Act (1976 as amended). | Records of common frog within Rathcoole Woodlands (NBDC record 2020) and in the ponds to the north of Rathcoole Park which the Coolmine flows into (NBDC records 2018, 2019 & 2020).<br><br>Frog observed during a stream safari conducted as part of this project. It was by the Coolmine Stream near Site 2 (observed by C.Flynn and confirmed by author of this |

[2]Annex I – habitat types whose conservation requires the designation of Special Areas of Conservation.
Annex II – animal or plant species whose conservation requires the designation of Special Areas of Conservation.
Annex IV – animal or plant species in need of strict protection
Annex V – animal or plant species b whose taking in the wild and exploitation may be subject to management measures.

| Species/Habitat | Designation[2] | Records |
|---|---|---|
| | | report, 29th Sept 2024). Habitats are considered to be suitable for common frog with freshwater and long grass/ vegetation for non-breeding adults within the woodland. |
| Smooth newt (*Lissotriton vulgaris*) | -Irish Wildlife Act (1976 as amended). | Historic record (NBDC record 1972) of smooth newt at the entrance to Rathcoole Park opposite Avoca. The potential for newt to be present within the ponds in Rathcoole Park cannot be excluded. |
| Kingfisher (*Alcedo atthis*) | -Annex II of the EU Habitats Directive (92/43/EEC)<br><br>-Amber listed on Birds of Conservation Concern in Ireland (2020- 2026) | Record of Kingfisher within Rathcoole Park (NBDC record 2023). |
| Mute swan (*Cygnus olor*) | -Irish Wildlife Act (1976 as amended).<br><br>-Amber listed on Birds of Conservation Concern in Ireland (2020- 2026) | Record (NBDC record 2022) of a mute swan and cygnets within the ponds in Rathcoole Park. |
| Grey Heron (*Ardea cinerea*) | - | Record (NBDC record 2022) of grey heron within Rathcoole Park |
| Common Blue Damselfly (*Enallagma cyathigerum*)<br><br>Common Darter (*Sympetrum striolatum*)<br><br>Emperor Dragonfly (*Anax imperator*)<br><br>Large Red Damselfly (*Pyrrhosoma nymphula*)<br><br>Migrant Hawker (*Aeshna mixta*) | - | Although dragonflies and damselflies are not protected under Irish or European legislation records are noted as they are an important part of freshwater ecosystems.<br><br>Records of common blue (NBDC, 2020) and large red (NBDC record 2023) in Millrace Gardens housing estate which adjoins the Rathcoole Park.<br><br>Record of migrant hawker (NBDC record 2020) and common darter (NBDC record 2021) along Rathcoole Woodlands boundary in a housing estate.<br><br>Records of emperor dragonfly (NBDC record 2023) in the ponds at city west golf course 560m west of Rathcoole Park. |
| Brown trout (*Salmo trutta*) | - | Although trout are not protected under Irish or European legislation records are noted as trout are an important part of freshwater ecosystems and are a source of food for protected species such as otter.<br><br>There are no records of trout within the Coolmine or Crockshane streams however this may be due to a lack of survey.<br><br>There are records of brown trout within the Camac River. A 2017 fish survey conducted by Inland Fisheries Ireland (IFI) recorded brown trout at five sites downstream of Rathcoole Park (IFI, 2017). Brown trout was noted as the most abundant species in the Camac and the closest survey site was 3.1km downstream of the park. |

| Species/Habitat | Designation[2] | Records |
|---|---|---|
| | | In August 2023, a fish kill in a 3.5km stretch of the Camac (which included Rathcoole Park) was investigated by IFI. 500 dead brown trout were recorded and the incident was attributed to the accidental spillage of harmful material during the commissioning of a new water treatment plant. See **Plate 3-2.** (Click link for **IFI press release**) |
| Sea/river/brook lamprey (*Petromyzon marinus, Lampetra fluviatilis, Lampetra planeri*) | Annex II of the EU Habitats Directive (92/43/EEC) (all three species)<br><br>Annex V of the EU Habitats Directive (92/43/EEC) (river only) | Given the urbanised nature of the Camac with a number of fish barriers recorded as well as the small size of the Coolmine and Crockshane streams it is considered unlikely they support migratory lamprey species (sea and river)<br><br>A 2017 fish survey conducted by IFI recorded an unspecified lamprey in the Camac at Corkagh Park 4.7km downstream of Rathcoole Park (IFI, 2017). The species is not specified but likely it was the non-migratory brook lamprey. The presence of brook lamprey cannot be excluded.<br><br>In August 2023, a fish kill in a 3.5km stretch of the Camac (which included Rathcoole Park) was investigated by IFI. 250 dead lamprey (species unspecified) were recorded and the incident was attributed to the accidental spillage of harmful material during the commissioning of a new water treatment plant. (Click link for **IFI press release**). |
| European eel (*Anguilla anguilla*) | IUCN Red listed as a critically endangered species | A 2011 fish survey conducted by IFI recorded eel in the Camac 3.1km downstream of Rathcoole Park (Kelly *et. al*., 2012). This species was not picked up again in later surveys at this site in 2017 (IFI, 2017). |
| Habitats | Annex I of the EU Habitats Directive (92/43/EEC) | A survey of the habitats within Rathcoole Woodlands identified four Annex I habitats (Hodd, 2021). These are Alluvial Woodland (91E0) which forms the majority of the woodland habitat, Lowland hay meadows (6510), Petrifying springs (7220) and Tall herb communities (6430). |
| Protected Aquatic plants | (Flora Protection Order 2022) | Following desktop review, no protected aquatic plants have been recorded within Coolmine, Crockshane or Camac. |

**Plate 3-1: Dead white-clawed crayfish found in the Camac up and downstream of the weir following a pollution incident in August 2023. Photo credit Annie Flynn.**

**Plate 3-2: Dead brown trout found in the Camac up and downstream of the weir following a suspected incident in August 2023. Photo credit Annie Flynn.**

# 4. FIELD SURVEY RESULTS

The following sections contain the details of the survey results. For quick reference the results are summarised in **Section 5**, **Table 5-1**.

## 4.1. Site 1 - Crockshane Stream

### *4.1.1. General characteristics*

One site was sampled on the Crockshane stream (Site 1). This is a small narrow stream 0.5m (wetted width) and at the time of survey water was clear and very shallow (0.03m). Flow was slow and the river flow habitat was mainly uniform glide owing to the shallow water. The stream follows a modified channel which is straightened and deepened with steep vertical banks (1.5m) and largely cut off from a floodplain. On the 27/09/2024 the stream was revisited following a day of very heavy rainfall (12.5mm recorded at Casement met station on the 26/09/2024). The water levels were still very shallow.

Bankside vegetation consisted of hazel (*Corylus avellana*) and hawthorn (*Crataegus monogyna*) trees with elder (*Sambucus nigra*), beech (*Fagus sylvatica*) and ivy (*Hedera hibernica*). These trees form a narrow riparian buffer zone (5m width) on the right bank followed by improved agricultural grassland. The trees along the stream here were classed as a heritage hedgerow (highly significant) (Wilson & Denyer, 2021). Interestingly historical 25" mapping shows a footpath along the right bank leading to the old Swiftbrook paper mills. On the left bank there is a wider buffer formed by a mosaic of immature woodland, dry meadows, wet grassland and scrub (Hodd, 2021). One third schedule invasive species was noted close to the stream which was Japanese knotweed (*Reynoutria japonica*), please see **Section 4.4** for more detail.

The stream substrate was dominated by gravels with some cobbles present and moderate siltation was observed (10% silt). When the substrate was disturbed a heavy plume of silt was formed indicating siltation within the gravel interstices. Although flow was very low at the time of survey it is evident from erosion of the banks that flows can be quite high and fast during periods of heavy rainfall as the water is funnelled through the narrow channel.

No aquatic plants were observed on the day of survey. The stream here is moderately shaded by the trees which would explain the lack of plants but also fast flows may also wash any colonising plants from the gravels. Litter is quite abundant within the stream and along the left bank. Downstream the Crockshane turns at an almost 90-degree angle and enters the Camac just upstream of the metal bridge. This section was disturbed in 2019 following pipe works and there is more light reaching this section, the channel here is wider and dominated with fool's watercress (*Apium nodiflorum*).

The results of the physico-chemical parameters recorded are summarised in **Appendix B**. Oxygen was slightly low at 8.07mg/l but not of significant concern and likely due to the very low water levels on the day of survey. The remaining parameters were considered within normal range with pH and conductivity indicating a slight calcareous influence.

**Plate 4-1: Crockshane steam looking upstream at Site 1.**

**Plate 4-2:Crockshane stream looking downstream at Site 1.**

**Plate 4-3: Example of river substrate within the Crockshane stream**

**Plate 4-4: Crockshane stream (yellow arrow) entering the Camac.**

### *4.1.2. Biological water quality*

The kick sample showed low macroinvertebrate diversity and density. Ten taxa were present in the sample and most of these were made up of pollution tolerant taxa (Group C). No sensitive taxa were present (Group A). Two less sensitive (Group B) taxa were present in low numbers and these where the cased caddisflies, Glossosomatidae and Limnephilidae. The freshwater shrimp (*Gammarus* sp.) was the only taxa that was common in the sample and the remaining were in low numbers. Give the low diversity, density and lack of any Group A taxa a **Q3** was assigned indicating **Poor macroinvertebrate quality**. Please see **Appendix A** for full list of macroinvertebrates and abundances.

### *4.1.3. White-clawed crayfish survey*

No crayfish were identified within the Crockshane stream at Site 1. The habitat conditions observed would indicate that this stream is not suitable to sustain a population of white-clawed crayfish. Although crayfish can be found in shallow streams with depth of about 0.05cm (Holdich, 2003) the water levels were shallower in the Crockshane on the day of survey (0.03m). Suitable refuges were lacking with an absence of boulders and large cobbles. Other possible refuges where also absent for example there was no instream vegetation, no large woody debris and no soft banks for burrowing. Given the low water and lack of refuges it is considered the habitat is unsuitable for crayfish.

## 4.2. Sites 2 & 3 - Coolmine stream

### *4.2.1. General characteristics*

The Coolmine stream was sampled at two locations, Site 2 is within the woodlands close to the south-western boundary and Site 3 is 470m downstream just at Rathcoole Park before the stream enters the ponds. A drainage ditch runs perpendicular between the Crockshane and the Coolmine but this was completely dry on the day of survey.

At Site 2 the stream is narrow (1m wetted width) and at the time of survey water was clear and shallow (0.1m) although not as shallow as the Crockshane. Flow was slow and the river flow habitat was mainly uniform glide owing to the shallow water. The stream appears to follow a modified channel which has been widened and deepened with high set back banks (1m -1.5m) and largely cut off from a floodplain. Bankside vegetation consisted of willow (*Salix* sp.), birch (*Betula* sp.), elder (*Sambucus nigra*), with bracken (*Pteridium aquilinum*), nettle (*Urtica dioica*) and ivy (*Hedera hibernica*) dominating the ground flora. The woodland here forms a wide riparian buffer zone supporting the stream.

The stream substrate was dominated by gravels with some cobbles present and heavy siltation was observed (20% silt). In very slow-moving sections 100% of the substrate surface was covered in silt. When the substrate was disturbed a heavy plume of silt was formed indicating siltation within the gravel interstices also. Although flow was low at the time of survey it is evident from the erosion of the banks that flows can be quite high and fast during periods of heavy rainfall.

No aquatic plants were observed on the day of survey. The stream has moderate to heavy shading by the trees which would explain the lack of plants. Fast flows may also wash away any colonising plants from gravels. The only aquatic plants observed were at the nearby spring. The ground surface was dry around the spring on the day of survey, but fool's watercress (*Apium nodiflorum*) and watercress (*Nasturtium officinale*) were growing indicating water close to the surface.

**Plate 4-5: Coolmine stream facing upstream at Site 2.**

**Plate 4-6: Coolmine stream facing downstream at Site 2.**

**Plate 4-7: Example of typical substrate within the Coolmine**

**Plate 4-8: Example of heavy siltation of the substrate in slower moving sections of the Coolmine.**

Further downstream at Site 3 conditions were similar with a narrow channel (1m wetted width) and clear shallow water (0.1m depth). Flow was slow and the river flow habitat continued as a uniform glide. The stream follows a modified channel which has been straightened, widened and deepened historically with steep high banks (2m). This makes the majority of the Coolmine stream flowing through the woodland cut off from a floodplain. Bankside vegetation consisted of a beech (*Fagus sylvatica*) and hawthorn (*Crataegus monogyna*) dominated treeline along the left bank with lime trees (*Tilia* sp.), grasses, meadowsweet (*Filipendula ulmaria*) and bramble (*Rubus fruticosus* agg.) along the right bank. The amenity grass of Rathcoole Park forms the riparian buffer along the left bank while along the right bank the grassland habitat identified as Annex I Lowland hay meadow (Hodd, 2021) is present.

The stream here is quite shaded and tunnelled by vegetation in sections. In areas where there is some light a small amount of fool's watercress (*Apium nodiflorum*) and watercress (*Nasturtium officinale*) were growing in the margins. Substrate was still dominated with gravels at this site and heavily silted (30%).

The results of the physico-chemical parameters recorded are summarised in **Appendix B.** Oxygen, pH, temperature and conductivity readings were within the normal range at both Site 2 and Site 3 with the pH and conductivity indicating a slight calcareous influence. Three-spined stickleback fish were present within the sample at Site 3. This is a small native fish occupying a range of freshwater habitats including ponds and brackish waters. It is quite tolerant of polluted conditions and low oxygen levels.

Further downstream where the stream opens out into a series of ponds the water turned from clear to grey coloured. This would indicate that there is potential point source(s) discharge into the ponds either from household or industry misconnections which would need to be further investigated. A misconnection is when wastewater from showers, toilets, sinks, washing machines, dryers are connected to the surface water network instead of the sewage network.

**Plate 4-9: Coolmine stream looking upstream at Site 3.**

**Plate 4-10: Coolmine stream looking downstream at Site 3.**

**Plate 4-11: Example of the substrate and aquatic plants at Site 3**

**Plate 4-12: Three-spined stickle back present within the macroinvertebrate sample at Site 3 (returned back to the water).**

**Plate 4-13: Habitat opens along the Coolmine as it flows through the park.**

**Plate 4-14: Grey coloured water within the ponds in Rathcoole Park indicting point source(s) pollution**

### *4.2.2. Biological water quality*

At Site 2 the kick sample showed a slightly higher diversity compared to the Crockshane however it was still considered to be low. Fourteen taxa were present in the sample and most of these were made up of pollution tolerant taxa (Group C). No sensitive taxa were present (Group A). Three less sensitive (Group B) taxa were present in low numbers and these where the cased caddisflies, Limnephilidae and Sericostomatidae and the mayfly *Alainites muticus*. The freshwater shrimp (*Gammarus* sp.) and New Zealand mud snail (*Potamopyrgus antipodarum*) were common. The mud snail is not native to Ireland and its now widely distributed and can be very abundant in some habitats. The remaining taxa were present in low numbers including one very pollution tolerant taxon (Group D), the water louse (*Asellus aquaticus*). Give the low diversity, density and lack of any Group A taxa a **Q3** was assigned indicating **Poor macroinvertebrate quality**.

The results of the macroinvertebrate kick sample were similar at Site 3. Sixteen taxa were recorded and again most of these were made up of pollution tolerant taxa (Group C). No sensitive taxa (Group A) were present. Two less sensitive (Group B) taxa were present in low numbers and these where the cased caddisfly, Sericostomatidae and a mayfly (*Alainites muticus*). The freshwater shrimp (*Gammarus* sp.), mayfly (*Baetis rhodani/atlanticus*) and diperan larva (Dicranota) were common in the sample. The remaining were present in low numbers including one very pollution tolerant taxa (Group D), the water louse (*Asellus aquaticus*) and one most tolerant taxa (Group E), freshwater worm (Tubificinae). A **Q3** was assigned indicating **Poor macroinvertebrate quality**. Please see **Appendix A** for full list of macroinvertebrates and abundances.

### *4.2.3. White-clawed crayfish survey*

No crayfish were identified within the Coolmine stream at either Site 2 or Site 3. The habitat conditions observed would indicate that this stream is not suitable to sustain a population of white-clawed crayfish. Water levels were shallow on the day of survey (0.1m) but not beyond the limits of crayfish as they can be found in streams as shallow as 0.05cm (Holdich, 2003). However, suitable refuges were lacking with an absence of boulders, large cobbles, soft banks for burrowing and instream vegetation. There was a lot of woody debris present at Site 2, but this is potentially unstable during higher flows. A series of weirs downstream in the park act as barriers for the upward movement of crayfish and it is considered unlikely that crayfish are present upstream of these weirs.

## 4.3. Sites 4, 5 & 6 - Camac River

### *4.3.1. General characteristics*

The Camac was sampled at three locations. Site 4 is just downstream of the metal bridge and both a macroinvertebrate sample and crayfish survey were undertaken. At Site 5 only a crayfish survey was conducted, this site starts upstream the metal bridge opposite the Swiftbrook Millpond (west). Site 4 and 5 are close to each other with similar habitat. Site 6 is located upstream of the park at the Slade Road bridge. The desktop survey identified records of crayfish at this site and a survey was conducted to assess if they are still present.

The Camac is larger than the Crockshane and Coolmine streams with a wetted width of 3m at Site 4 and narrows sightly as one moves to the upstream sites. Water levels were between 0.15m to 0.25m with the shallowest water upstream at Site 6. Flow was moderate to fast. Habitat is dominated by riffle and glide with only the occasional deeper pools at Sites 4 and 5 but no pools were present at Site 6. The banks are steep (2-3m height) and the river is constrained within the bank with limited access to a natural floodplain at all sites.

**Plate 4-15: Camac River at Site 4 looking u/s**

**Plate 4-16: Camac River at Site 4 looking d/s**

**Plate 4-17: Camac River at Sit 5 looking u/s**

**Plate 4-18: Camac River at Site 5 looking u/s**

A weir is present on the Camac just beside the Swiftbrook Millpond (east) and IFI have classed this weir as a barrier to fish migration which would include crayfish.

River substrate is a mixture of cobble and coarse gravel with occasional boulders. Siltation is low to moderate (2- 5%) however when the substrate was disturbed a heavy plume of silt was formed indicating siltation within the gravel interstices.

The channel at Sites 4 and 5 is moderately shaded and aquatic vegetation is sparse with small amounts of fool's watercress (*Apium nodiflorum*), watercress (*Nasturtium officinale*) and the aquatic Kneiff's feather-moss (*Leptodictyum riparium*) present at Site 4. Upstream at Site 5 the liverwort *Chiloscyphus polyanthos* and emergent branched bur reed (*Sparganium erectum*) were also present. Along the banks of sites 4 and 5 there is a narrow broadleaved treeline dominated with elder (*Sambucus nigra*) along with some holly (*Ilex aquifolium*), ash (*Fraxinus excelsior*), willow (*Salix* sp.), beech (*Fagus sylvatica*) and sycamore (*Acer pseudoplatanus*) with bramble (*Rubus fruticosus* agg.), ivy (*Hedera hibernica*) and nettle (*Urtica dioica*) in the understorey.

At Site 6 the only instream vegetation present was 5% filamentous green algae. A little further downstream at the nursing home the channel slows and became dominated with fool's watercress. The algae and dense vegetation here would indicate nutrient enrichment. Bankside vegetation at Site 6 is dominated with butterbur (*Petasites hybridus*) with bramble (*Rubus fruticosus* agg.), gorse (*Ulex europaeus*) and willow (Salix sp.) also present.

The results of the physico-chemical parameters recorded are summarised in **Appendix B**. Oxygen, pH, temperature and conductivity readings were within the normal range at both sites.

**Plate 4-19: Wier on the Camac which is classed as a barrier by IFI for fish and crayfish.**

**Plate 4-20: Site 6 facing upstream with butterbur growing along the banks.**

### *4.3.2. Biological water quality*

A kick sample for macroinvertebrates was taken at Site 4 and in total 21 taxa were identified in the sample. Two pollution sensitive taxa (Group A) were present but in very low numbers. These were the flattened mayfly (*Heptagenia* sp.) and only one specimen of another flattened mayfly (*Rhithrogena* sp.) was found and therefore it is not counted toward the Q-value.

The remainder of the sample consisted of Group B and Group C taxa with the later the most abundant. The New Zealand mud snail (*Potamopygrus antipodarum*) was numerous while the blue-winged olive mayfly (*Seretella ignita*), riffle beetle (*Limnius volckmari*) and freshwater shrimp (*Gammarus* sp.) were common.

Group A taxa were present but not well represented and the community was slightly unbalanced. A **Q3-4** was assigned indicating **Moderate macroinvertebrate quality**. This result conforms with EPA monitoring results in 2022 at the monitoring station approximately 675m upstream.

### *4.3.3. White-clawed crayfish survey*

The survey at Site 4 covered a 100m transect from downstream the metal bridge to just upstream of this bridge. Site 5 covered a 100m transect from the Swiftbrook Millpond (west) to just above the weir. Site 6 covered a 100m transect in the Camac upstream of the park at the Slade Road Br.

The survey did not identify any crayfish at either of these sites (Sites 4-6).

Physico-chemical conditions at the time of survey were supportive of crayfish in the Camac at all sites assessed (see **Appendix B).** While Moderate macroinvertebrate quality (Q3-4) was assigned to the Camac River it is not considered the main factor explaining why crayfish were absent. Crayfish can tolerate moderate water quality conditions and Demers et al., (2005) suggested that crayfish prefer waters of Q3-4 to Q4. The author has also observed crayfish populations in streams with Poor macroinvertebrate quality (Q3).

Cobbles and woody debris are commonly available forming good refuges for crayfish at all sites however larger substrate like boulders were limited. Instream vegetation was limited at Site 4. At Site 5 there was slightly more vegetation and at Site 6 the only instream vegetation was a fair amount of filamentous green algae (5%) but further downstream the channel becomes dominated with fool's watercress where the river slows.

Water depth was fairly shallow at all sites but not considered out of range for crayfish (0.15 to 0.2m). Some deeper sections were present at Site 5. Flow was moderate to fast particularly in the shallow riffle

areas. Slower moving areas with deeper pools were present but rare. The channel is constrained between high banks at all sites which likely results in fast flows in times of heavy rainfall. With no soft banks for burrowing, larger boulders or silted areas there is potentially a lack of suitable habitat crayfish can use to take refuge during flood events. Crayfish had been recorded at Site 6 in 2013 during an EPA survey but were absent from this survey.

Crayfish are either absent from the section of the Camac surveyed or occur in such low numbers that the survey method did not detect them.

## 4.4. Site 7 - Swiftbrook Millpond (east)

This is narrow linear pond with a footpath around the pond except along the eastern margin. Mature broadleaved trees overhang the east and western margins of the pond. Water from the Camac millrace enters the pond in the southeastern corner and discharges to the Swiftbrook Millpond (west) at the other end of the pond along the western margin. Water levels were shallow and at 0.30cm were just deep enough to set the crayfish traps. Depth did not vary across the pond and was generally even throughout. Substate was silt dominated which was deep and sinking.

Most of the pond is heavily vegetated with reedmace (*Typha latifolia*) with an open water area mainly concentrated in the southern section of the pond and small open areas along margins. Other aquatic vegetation included reed canary grass (*Phalaris arundinacea*) and floating lesser duckweed (*Lemna minor*). Five traps were deployed along the eastern, southern and western margins of the pond. No crayfish were caught in any of the five traps.

Owing to the very dense emergent vegetation in this pond the habitat is sub-optimal for crayfish in the majority of the pond.

**Plate 4-21: The Camac millrace just before it enters the mill pond (east).**

**Plate 4-22: Millpond along the southern section with dense Typha stand visible. Yellow arrow shows approximate location of the inflow and outflow.**

**Plate 4-23: Swiftbrook millpond (west) which vegetated with reedmace. From here the water enters the Camac just upstream of the metal bridge.**

**Plate 4-24: Example of one of the crayfish Swedish traps.**

## 4.5. Third Schedule Invasive Species

One invasive species listed on the Third Schedule was identified within Rathcoole Woodlands during the survey. This was **Japanese knotweed (*Reynoutria japonica*)** which is classed as having a risk of high impact in a risk assessment of invasives of Ireland (Kelly et al., 2013). The knotweed was identified to the east of the site in an area of immature woodland and scrub (53.27935, -6.45623). This is the same location where it had been noted in previous surveys (Wilson & Denyer 2021; Hodd, 2021). The knotweed is adjacent to calcareous spring habitat identified by Wilson & Denyer (2021). In the same report it was noted that the habitat does not conform to Annex I Petrifying Springs but is considered to be Local (Higher) ecological importance.

There is a risk of disturbance and further spread should this stand of knotweed be left unmanaged. There is a risk of the knotweed spreading further into the adjacent habitats mapped as dry meadows and grassy verges, wet grassland and scrub mosaic by Wilson & Denyer (2021). In addition, the knotweed is situated next to a well-used track and approximately 20-25m from the Crockshane Stream and therefore there is potential for the plant to reach the stream banks. Further spread can be facilitated by the stream itself as the knotweed can be transported downstream to the Camac River.

The main risks associated with knotweed growing along stream banks is that it outcompetes native plants creating stands of a single species rather than a mixed riparian habitat. When the plant dies back in winter it leaves banks exposed and vulnerable to erosion introducing sediment into the river system.

Knotweed spreads easily when disturbed via fragmentation of rhizomes (underground modified stems) and should not be cut or trimmed as a control method. It should be treated using proper application of herbicides approved for use near water by a qualified user. If not in place already, a management plan should be developed by those responsible for the lands to map the extent of the infestation and outline the method of control.

A second third schedule invasive species was noted within Rathcoole Park outside of the woodlands. This was **giant rhubarb (*Gunnera tinctoria*)** located on the right bank of the Coolmine stream just as it enters the ponds (53.28159, -6.45893). This plant is also classed as having a risk of high impact. The plant produces a high number of seeds which are spread via water and also birds. It can also spread cl via rhizomes. Given that the plant is located on the bank of the Coolmine before the ponds which contain wildfowl there is a risk of further spread. Its huge leaves impact local biodiversity through light exclusion and like knotweed when it dies back in winter the soil along the bank is exposed to erosion.

**Plate 4-25: Stand of Japanese knotweed identified close to the Crockshane stream.**

**Plate 4-26: Gunnera identified along the Coolmine stream highlighted in the yellow circle.**

# 5. SUMMARY OF RESULTS

The results of the macroinvertebrate and crayfish surveys are summarised in **Table 5-1** below.

**Table 5-1: Summary of the field survey results at each site surveys (CPUE =catch per unit effort).**

| Site name | Q-value | Crayfish CPUE | Note |
|---|---|---|---|
| Site 1- Crockshane stream | Q3 | 0 | Unsuitable habitat for crayfish |
| Site 2 – Coolmine stream in woodlands | Q3 | 0 | Unsuitable habitat for crayfish |
| Site 3 – Coolmine in park | Q3 | 0 | Unsuitable habitat for crayfish |
| Site 4 - Camac River d/s metal bridge | Q3-4 | 0 | Good habitat for crayfish although slight siltation |
| Site 5 – Camac River near weir | n/a | 0 | Good habitat for crayfish although slight siltation |
| Site 6 – Camac at Slade Road Br. | n/a | 0 | Good habitat for crayfish available |
| Site 7- Swiftbrook Millpond (east) | n/a | 0 | Suboptimal habitat for crayfish |

The macroinvertebrate quality within the Crockshane and Coolmine is poor with a Q3 assigned at the sites surveyed (Site 1-3). With high banks, deepening, siltation, limited coarse substrate and very low water levels it is considered that hydromorphology is a pressure acting upon these small streams. Hydromorphology refers to the physical character of the stream and includes the flow of water in the stream, the course the stream takes or the form and shape of the stream channel. The streams appear to have been modified historically into drainage channels losing their more natural characteristics.

The hydromorphological conditions observed on the day can help explain the poor macroinvertebrate quality but influence from upstream activities cannot be ruled out. The streams flow through improved agricultural pasture and there is potential for nutrients to enter these streams. An excessive amount of filamentous green algae or aquatic plants can be indicative of nutrient enrichment. However, the shaded conditions within the woodland limit algae and plant growth and therefore nutrient enrichment could not be ruled out/in. Water sampling and testing for nutrients could help to eliminate this as a potential pressure.

In addition, siltation of the substrate in both streams was another pressure identified. While some silt is a natural feature, excessive siltation can impact water quality. It can smother river substrates altering the habitat for aquatic plants and macroinvertebrates leading to changes in the community composition. Excessive fine sediments can degrade spawning habitat, lead to increased egg mortality and even cause damage to fish gills (Kemp et al., 2011; Cocchiglia et al., 2012). Sources of silt in the woodland could be from upstream point sources such as cattle access points but it is also clear that the banks are heavily eroded during periods of high flows contributing to the silt load in the streams.

In the Camac, the macroinvertebrate water quality improved slightly to moderate (Q3-4) but is not achieving its WFD objective of Good. This result agrees with the most recent 2022 EPA monitoring result taken a short distance upstream. Hydromorphology and invasive species are listed by the EPA as significant pressures by the EPA for the Camac_010 waterbody.

Japanese knotweed was identified in close proximity to the Crockshane Stream. Given that invasive species have been identified as one of the significant pressures on the Camac the further spread of this stand should not be allowed as it can potentially reach the Crockshane and spread to the Camac. A programme of management and control is required to prevent further spread.

No crayfish were identified at any site surveyed. Due to the very low summer flows and lack of refuges it is considered that the Crockshane and Coolmine streams are not supportive of crayfish at the sites surveyed. Additionally, the weirs along the Coolmine in the park (and potentially the culvert under the N7) form a barrier for the movement of crayfish into the Coolmine from the Camac.

While the Camac does have good crayfish habitat none were identified at any of the sites surveyed. This is a surprising result given that there is habitat present and the Camac is known to support good population of crayfish further downstream. Crayfish are either absent from the sections of Camac surveyed or occur in such low numbers that the survey method did not detect them. Should the later be correct then a small population may be very vulnerable to serious pollution events as repopulation from downstream sources may not be possible due to barriers (e.g., the weir on the Camac or potentially the culvert under the N7 is a barrier but would need to be confirmed).

On the other hand, this isolation could make the upper reaches of the Camac a potential arc site for the white-clawed crayfish. With crayfish plague already impacting so many Irish rivers it makes any population within the upper reaches of the Camac important to protect and potentially restoration project could be explored.

# 6. DISCUSSION

Despite the discussed pressures acting upon both the Crockshane and Coolmine stream they still play an important role supporting the adjacent habitats and species within Rathcoole Woodlands.

The streams act as **ecological corridors** connecting agricultural lands to the woodlands and park (and vice versa). This corridor is essential in helping to facilitate the movement of species in the upper catchment of the Camac before it is fragmented by the N7. It is a good example of an ecological corridor connecting habitats under the ever-increasing urbanization of Dublin.

The SDCC Draft Biodiversity Action Plan (which Rathcoole falls under) recognises the importance of connected habitats and summaries the concept quite succinctly. The following is quoted from the plan (SDCC, 2020).

> "*Ensuring there are green links or 'stepping stones' between protected and unprotected areas for biodiversity will help wildlife move safely through the County, assisting them to adapt to changing environmental conditions such as the loss of quality habitat or the effects of climate change. Article 10 of the EU Habitats Directive recognises the importance of these stepping stones and requires us to maintain areas of wildlife interest outside of protected sites*."
>
> "*In the countryside, wildlife moves from place to place using the protective cover of natural features such as hedgerows, ditches, tree lines, old walls, rivers and streams. These features are even more important in our cities and towns. If routes through South Dublin County can be identified to link the countryside and the protected sites listed above* [list does not include Rathcoole Woodlands] *to public parks and private gardens in our towns and villages, then an effective network of corridors or stepping stones for nature can be achieved*"

The streams and woodland are also providing **natural water retention**. This feature could be further improved by re-naturalising the Crockshane and Coolmine and allowing better connectivity to a floodplain (following detailed surveys to ensure no impact upon existing habitats and hydrology). Without careful consideration and planning the development of the area could lead to increased surface water via urban runoff reaching the streams faster and beyond their capacity. Currently the woodland and other habitats help filter and slow the flow of surface water runoff. Floodplain interactions are important for the habitats they support but also the potential flood attenuation capacity they can provide for the Camac catchment area. This is termed natural flood mitigation measures and there is potential to explore these measures while supporting, protecting and improving the existing habitats.

Under the newly publish River Basin Management Plan (2022-2027) all the waterbodies in the Camac are designated as an **Area for Action** (this would include the Crockshane and Coolmine tributaries). One of the reasons it has been designated as an AFA is to pursue opportunistic river restoration improvements to provide co-benefits to the proposed flood alleviation scheme along the Camac. The Rathcoole Woodland could be site which has potential to support this action.

In terms of developments near watercourses, Inland Fisheries Ireland have published a **guidance document for planning for watercourses** in the urban environment. This includes guidance on the protection of riparian buffer zones, the uses of sustainable urban drainage and instream rehabilitation (IFI, 2020). Within this document, minimum set back distances for riparian zones are stipulated (see **Figure 6-1**). Adherence to this document has now become a common planning condition and any proposed development should ensure the recommended riparian buffer zones are met.

Finally, the **lack of crayfish within the Camac** is surprising given there is suitable habitat and the Camac is known to support good crayfish populations downstream. Following a pollution incident in 2023 IFI

found 250 dead crayfish indicating that the Camac and/or Millrace here can (or at least did) support crayfish. The lack of crayfish a year later following the pollution incident is of concern. Should a population exist upstream of the 2023 pollution source then potentially the crayfish have not recovered to detectable levels yet. Repopulation from downstream sources is not possible due to barriers. The crayfish in the Camac upstream of the N7 are very vulnerable to pollution incidents and without careful management are at risk.

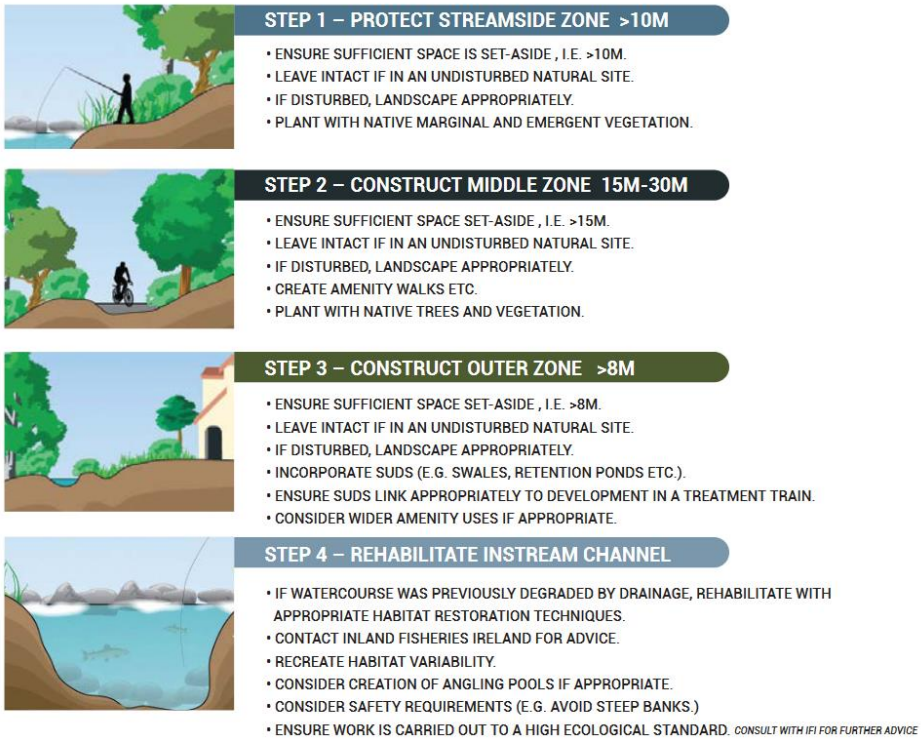


**Figure 6-1: Image from the Inland Fisheries Ireland guidance document showing example of river planning and buffer zones (IFI, 2020). Please not that these are the minimum distance to be achieved not a set distance.**

# 7. REFERENCES

Cocchiglia, L., Curran, S., Hannigan, E., Purcell, P. J., & Kelly-Quinn, M. (2012). Evaluation of the effects of fine sediment inputs from stream culverts on brown trout egg survival through field and laboratory assessments. *Inland Waters*, *2*(1), 47-58.

Demers, A., Lucey, J., McGarrigle, M. & Reynolds, J. (2005). The distribution of the white-clawed crayfish (Austropotamobius pallipes) in Ireland. *Biology and Environment: proceeding of the Royal Irish Academy*: *105*B: 65-69.

Gilbert G., Stanbury A. & Lewis L. (2021). Birds of Conservation Concern in Ireland 2020 –2026. *Irish Birds 9*: 523—544.

Hodd R.L. (2021). A Survey to Assess the Woodlands and associated Semi-natural Habitats at Rathcoole, Co. Dublin. Nimbosa Ecology. Unpublished report to Four Districts Woodland Group, Rathcoole. Available at http://rathcoolewoodlands.org/wp-content/uploads/2021/12/Rory-Hodd-Report-on-Rathcoole-Habitats-Aug-2021.pdf

Hodd R.L. (2023). Survey of an area of the EU Habitats Directive Annex I Habitat 6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels at Rathcoole Woods, Co. Dublin. Nimbosa Ecology. Unpublished report to Four Districts Woodland Group, Rathcoole. Available at http://rathcoolewoodlands.org/wp-content/uploads/2023/11/Rathcoole_tall_herb_survey_V1.pdf

IFI (2017). Fish in Rivers Factsheet, ERFB Camac River Catchment. Factsheet 2017/3. Inland Fisheries Ireland. Available at http://wfdfish.ie/wp-content/uploads/2019/03/ERBD_Camac_2017.pdf

IFI (2020). Planning for Watercourses in the Urban Environment. A guide to the Protection of Watercourses through the use of Buffer Zones, Sustainable Drainage Systems, Instream Rehabilitation, Climate/ Flood Risk and Recreational Planning. Inland Fisheries Ireland, City West Business Campus, Dublin. Available at https://www.fisheriesireland.ie/sites/default/files/migrated/docman/IFIUrbanWatercoursesPlanningGuide.pdf

Kelly, F.L., Matson, R., Connor, L., Feeney, R., Morrissey, E., Wogerbauer, C. & Rocks, K. (2012). Water Framework Directive Fish Stock Survey of Rivers in the Eastern River Basin District. Inland Fisheries Ireland, Swords Business Campus, Swords, Co. Dublin, Ireland.

Kelly, J., O'Flynn, C., & Maguire, C. (2013). Risk analysis and prioritisation for invasive and non-native species in Ireland and Northern Ireland. http://invasivespeciesireland.com/wp-content/uploads/2013/03/Risk-analysis-and-prioritization-29032012-FINAL.pdf.

Kemp, P., Sear, D., Collins, A., Naden, P., & Jones, I. (2011). The impacts of fine sediment on riverine fish. *Hydrological processes*, *25*(11), 1800-1821.

McGarrigle, M.L., Bowman, J. J., Clabby, K. J., Lucey, J., Cunningham, P., MacCárthaigh, M., Keegan, M., Cantrell, B., Lehane, M., Clenaghan C. & Toner, P. F. (2002). *Water Quality in Ireland 1998 – 2000*. Environmental Protection Agency, Johnstown Castle Ireland.

NPWS (2019a). *The Status of Protected EU Habitats and Species in Ireland. Volume 1: Summary Overview.* Unpublished Report, National Parks & Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin.

NPWS (2019b). *The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments*. Unpublished Report, National Parks and Wildlife Service. Department of Arts, Heritage and the Gaeltacht, Dublin.

NPWS (2019c). *The Status of EU Protected Habitats and Species in Ireland. Volume 3: Species Assessments*. Unpublished Report, National Parks and Wildlife Service. Department of Arts, Heritage and the Gaeltacht, Dublin.

O'Connor, W., Hayes G., O'Keeffe, C. & Lynn, D. (2009). Monitoring of white-clawed crayfish Austropotamobius pallipes in Irish lakes in 2007. *Irish Wildlife Manuals*, No *37.* National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

Peay, S. (2003). Monitoring the White-clawed Crayfish Austropotamobius pallipes. *Conserving Natura 2000 Rivers Monitoring Series No. 1*, English Nature, Peterborough.

Reynolds, J.D., O'Connor, W., O'Keeffe, C. & Lynn, D. (2010). A technical manual for monitoring white-clawed crayfish Austropotamobius pallipes in Irish lakes. *Irish Wildlife Manuals*, *No 45*. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin.

SDCC (2020). *Draft Biodiversity Action Plan for South County Dublin 2020-2026*. South Dublin County Council.

Sweeney, P. G., Reynolds, J., Nelson, B., & O'Flynn, C. (2022). First recorded population of the Common Yabby (Cherax destructor Clark)(Decapoda, Parastacidae) in the wild in Ireland. *The Irish Naturalists' Journal*, *39*, 14-19.

Wilson F., & Denyer, J. (2021). Ecological Assessment of Lands at Rathcoole, Co. Dublin. Stage 2 Draft SDCC Development Plan, Appendix 2B. South Dublin County Council.

Toner, P., Bowman, J, Clabby, K., Lucey, J., McGarrigle M., Concannon, C., Clenaghan C., Cunnunghan, P., Delaney, S., O'Boyle, S., MacCárthaigh, M., Craig, M., and Quinn, R. (2005). *Water Quality in Ireland 2001-2003*. Environmental Protection Agency, Johnstown Castle Ireland.

# APPENDIX A
# MACROINVERTEBRATE SPECIES LIST

**Table A-1: List of macroinvertebrates identified at Site 1 - Crockshane**

| Site name | Macroinvertebrate | Group | Pollution Tolerance | Abundance | Q-value |
|---|---|---|---|---|---|
| **Site 1** | Glossosomatidae | B | Less sensitive | Few | |
| | Limnephillidae | B | Less sensitive | Few | |
| **Crockshane Stream** | *Gammarus* sp. | C | Tolerant | Common | |
| | Chironomidae | C | Tolerant | Few | |
| | *Potamopyrgus antipodarum* | C | Tolerant | Few | Q3 |
| | *Dicranota* sp. | C | Tolerant | Few | |
| | *Baetis rhodani/atlanticus* | C | Tolerant | Few | |
| | Plantyhelminthes | C | Tolerant | Few | |
| | Lumbricidae | C | Tolerant | Few | |
| | *Helobdella stagnalis* | D | Very tolerant | Few | |

**Table A-2: List of macroinvertebrates identified at Site 2 -Coolmine Stream in woodlands.**

| Site name | Macroinvertebrate | Group | Pollution Tolerance | Abundance | Q-value |
|---|---|---|---|---|---|
| **Site 2** | *Alainites muticus* | B | Less sensitive | Few | |
| | Limnephillidae | B | Less sensitive | Few | |
| **Coolmine Stream in woodlands** | *Sericostoma personatum* | B | Less sensitive | Few | |
| | Simuliidae | C | Tolerant | Few | |
| | *Gammarus* sp. | C | Tolerant | Common | |
| | Lumbricidae | C | Tolerant | Few | |
| | *Baetis rhodani/atlanticus* | C | Tolerant | Few | |
| | *Elmis aenea* | C | Tolerant | Few | Q3 |
| | *Dicranota* sp. | C | Tolerant | Few | |
| | Dipertan larva | C | Tolerant | Few | |
| | *Potamopyrgus antipodarum* | C | Tolerant | Common | |
| | *Rhyacophila dorsalis* | C | Tolerant | Few | |
| | Philopotamidae | C | Tolerant | Few | |
| | Chironomidae | C | Tolerant | Few | |
| | *Asellus aquaticus* | D | Very tolerant | Few | |

**Table A-3: List of macroinvertebrates identified at Site 3 – Coolmine Stream in park.**

| Site name | Macroinvertebrate | Group | Pollution Tolerance | Abundance | Q-value |
|---|---|---|---|---|---|
| **Site 3** | *Alainites muticus* | B | Less sensitive | Few | Q3 |
| | *Sericostoma personatum* | B | Less sensitive | Few | |
| **Coolmine Stream in Park** | Simuliidae | C | Tolerant | Few | |
| | Gammarus sp. | C | Tolerant | Common | |
| | Lumbricidae | C | Tolerant | Few | |
| | *Baetis rhodani/atlanticus* | C | Tolerant | Common | |
| | *Elmis aenea* | C | Tolerant | Few | |
| | Dicranota sp. | C | Tolerant | Common | |
| | *Potamopyrgus antipodarum* | C | Tolerant | Few | |
| | Chironomidae | C | Tolerant | Few | |
| | *Hydracarina* sp. | C | Tolerant | Few | |
| | Nematomorph | C | Tolerant | Single | |
| | Hydraenidae | C | Tolerant | Few | |
| | *Limnius volckmari* | C | Tolerant | Few | |
| | *Asellus aquaticus* | D | Very tolerant | Few | |
| | Tubificinae | E | Most tolerant | Few | |

**Table A-4: List of macroinvertebrates identified at Site 4 – Camac River d/s metal bridge.**

| Site name | Macroinvertebrate | Group | Pollution Tolerance | Abundance | Q-value |
|---|---|---|---|---|---|
| **Site 4** | *Heptagenia* sp. | A | Sensitive | Few | Q3-4 |
| | *Rhithrogena* sp. | A | Sensitive | Single | |
| **Camac River d/s metal bridge** | *Alainites muticus* | B | Less sensitive | Few | |
| | *Sericostoma personatum* | B | Less sensitive | Few | |
| | *Leuctra* sp. | B | Less sensitive | Few | |
| | Limnephillidae | B | Less sensitive | Few | |
| | Odontoceridae | B | Less sensitive | Few | |
| | Simuliidae | C | Tolerant | Few | |
| | *Gammarus* sp. | C | Tolerant | Common | |
| | *Baetis rhodani/atlanticus* | C | Tolerant | Few | |
| | *Elmis aenea* | C | Tolerant | Few | |
| | *Dicranota* sp. | C | Tolerant | Few | |
| | *Potamopyrgus antipodarum* | C | Tolerant | Numerous | |
| | Chironomidae | C | Tolerant | Few | |
| | Hydraenidae | C | Tolerant | Few | |
| | *Limnius volckmari* | C | Tolerant | Common | |
| | *Rhyacophila dorsalis* | C | Tolerant | | |
| | *Serratella ignita* | C | Tolerant | Common | |
| | Lumbriculidae | C | Tolerant | Few | |
| | Esolus/Oulimnius | C | Tolerant | Few | |
| | Tubificinae | E | Most tolerant | Few | |

# APPENDIX B
# SUMMARY OF GENERAL RIVER HABITAT CHARACTERISTICS

**Table B- 1: Summary of the general habitat characteristics at each survey site.**

| Site No. | Bank height (m) | Wet width (m) | Bankfull width (m) | Depth (m) | Substrate (%) | Substrate Siltation | Shading | River habitat (%) | Physico-chem | Q-value | Note | Aquatic plants |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site 1 Crockshane Stream | 1.5 | 0.5 | 1 | 0.03 | Cobble: 20<br>Coarse gravel: 40<br>Fine gravel: 30<br>Sand: 0<br>Silt: 10 | Moderate with heavy plume when kicked | Moderate | Riffle: 10<br>Glide: 90<br>Pool: 0 | DO: 81.4% / 8.07 mg/l<br>Temp: 15.1°c<br>Conductivity: 520µS/cm<br>pH: 7.64 | Q3 | • Water level v. low<br>• Rubbish on bankside<br>• Deepened, widened and straightened<br>• Light to moderate bank erosion | None |
| Site 2 Coolmine Stream in woodlands | 1 -1.5 | 0.5 -1 | 1-3 | 0.1 | Cobble: 15<br>Coarse gravel: 30<br>Fine gravel: 35<br>Silt: 20 | Heavy with heavy plume when kicked | Moderate - Heavy | Riffle: 5<br>Glide: 95<br>Pool: 0 | DO: 87.4% / 8.71 mg/l<br>Temp: 14.7°c<br>Conductivity: 510µS/cm<br>pH: 7.65 | Q3 | • Deepened and widened with high set back banks in parts.<br>• Moderate bank erosion<br>• Low flow<br>• Very silted | None |
| Site 3 Coolmine Stream in park | 2 | 1 | 1.5 | 0.1 | Cobble: 10<br>Coarse gravel: 30<br>Fine gravel: 30<br>Sand: 0<br>Silt: 30 | Heavy with heavy plume when kicked | Moderate but heavy and tunnelled in sections | Riffle: 0<br>Glide: 100<br>Pool: 0 | DO: 88.6% / 8.80 mg/l<br>Temp: 14.9°c<br>Conductivity: 507µS/cm<br>pH: 7.85 | Q3 | • Deepened, widened and straightened<br>• High vertical banks<br>• Moderate erosion<br>• Three-spined stickleback<br>• Very silted<br>• Grey water as river enters ponds in park. | *Apium nodiflorum, Nasturtium officinale* |

| Site No. | Bank height (m) | Wet width (m) | Bankfull width (m) | Depth (m) | Substrate (%) | Substrate Siltation | Shading | River habitat (%) | Physico-chem | Q-value | Note | Aquatic plants |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Site 4 Camac River d/s metal bridge | 2-3 | 3 | 3 | 0.2 - 0.25 | Boulder: 2<br>Cobble: 35<br>Coarse gravel: 30<br>Fine gravel: 25<br>Sand: 3<br>Silt: 5 | Low- mod but heavy plume when kicked | Moderate | Riffle: 35<br>Glide: 60<br>Pool: 5 | DO: 90.1% / 8.77 mg/l<br>Temp: 15.8°c<br>Conductivity: 338µS/cm<br>pH: 7.60 | Q3-4 | • High banks | *Apium nodiflorum, Nasturtium officinale, Leptodictyum riparium* |
| Site 5 Camac River near weir | 1.5 | 2.5 | 3 | 0.25 | Boulder: 2<br>Cobble: 35<br>Coarse gravel: 30<br>Fine gravel: 25<br>Sand: 3<br>Silt: 5 | Low -mod but heavy plume when kicked | Moderate | Riffle: 35<br>Glide: 60<br>Pool: 5 | DO: 95.1% / 9.01 mg/l<br>Temp: 16.5°c<br>Conductivity: 387µS/cm<br>pH: 7.94 | n/a | • Weir which is a fish barrier | *Apium nodiflorum, Nasturtium officinale, Leptodictyum riparium, Chiloscyphus polyanthos, Sparganium erectum* |
| Site 6 Camac at Slade Road Br. | 2 | 2 | 2.5 | 0.2 | Boulder: 1<br>Cobble: 44<br>Coarse gravel: 35<br>Fine gravel: 18<br>Sand: 0<br>Silt: 2 | Low but heavy plume when kicked | Moderate | Riffle: 40<br>Glide: 60<br>Pool: 0 | DO: 97.7% / 10.5 mg/l<br>Temp: 11.6°c<br>Conductivity: 457µS/cm<br>pH: 7.85 | n/a | • Dense *A. nodiflorum* downstream of survey site | *Filamentous green algae* |
| Site 7 Swiftbrook Millpond (east) | - | - | - | 0.30 | Fine gravel: 20<br>Silt: 80 | Heavy | Low | Pond | DO: 93.7% / 10.4mg/l<br>Temp: 10.8°c<br>Conductivity: 421µS/cm<br>pH: 8.02 | n/a | • Dense *T. latifolia* stands | *Typha latifolia, Lemna minor, Phalaris arundinacea.* |

# APPENDIX C
# CRAYFISH RECORD CARD AND HABITAT SURVEY CARD

# Crayfish Survey Card

| | | | |
|---|---|---|---|
| **Catchment** | Liffey | **Surveyor** | Letizia Cocchiglia, Mayfly Ecology |
| **River** | Crockshane | **Date** | 07/08/2024 |
| **Site No.** | Site 1 Crockshane | **GPS** | 53.27771, -6.45845 / ITM 702808, 726373 |

**Abbreviations**

A: Austropotamobius pallipes
AX: Adult escaped
CP:Crayfish plague
Y: Female with young
J: Juvenile
JX: Juenile escaped
Z: Dead
GS: Old glair strands
F: Female
PD:Porcelain disease
B: Berried female

| Record No. | Species | Sex | CL (mm) | Damage | Disease | Breeding | Moult | Sub-site (Patch no.) | Catch method |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Standard search |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Additional Comments**

No crayfish were identified within the Crockshane stream at Site 1. The habitat conditions observed would indicate that this stream is not suitable to sustain a population of white-clawed crayfish. Although crayfish can be found in shallow streams with depth of about 0.05cm (Holdich, 2003) the water levels were shallower in the Crockshane on the day of survey (0.03m). Suitable refuges were lacking with an absence of boulders and large cobbles. Other possible refuges where also absent for example there was no instream vegetation, no large woody debris and no soft banks for burrowing. Given the low water and lack of refuges it is considered the stream contains unsuitable habitat for crayfish.

# Crayfish Survey Card

| | | | |
|---|---|---|---|
| **Catchment** | Liffey | **Surveyor** | Letizia Cocchiglia, Mayfly Ecology |
| **River** | Coolmine | **Date** | 07/08/2024 |
| **Site No.** | Site 2 Coolmine in woodlands | **GPS** | 53.27666, -6.46344 / ITM 702477, 726249 |

**Abbreviations**

A: Austropotamobius pallipes
AX: Adult escaped
CP:Crayfish plague
Y: Female with young
J: Juvenile
JX: Juenile escaped
Z: Dead
GS: Old glair strands
F: Female
PD:Porcelain disease
B: Berried female

| Record No. | Species | Sex | CL (mm) | Damage | Disease | Breeding | Moult | Sub-site (Patch no.) | Catch method |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Standard search |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Additional Comments**

No crayfish were identified within the Coolmine stream at Site 2. The habitat conditions observed would indicate that this stream is not suitable to sustain a population of white-clawed crayfish. Water levels were shallow on the day of survey (0.1m) but not beyond the limits of crayfish as they can be found in streams as shallow as 0.05cm (Holdich, 2003). However, suitable refuges were lacking with an absence of boulders, large cobbles, soft banks for burrowing and instream vegetation. There was a lot of woody debris present at Site 2, but this is potentially unstable during higher flows.

# Crayfish Survey Card

| | | | |
|---|---|---|---|
| **Catchment** | Liffey | **Surveyor** | Letizia Cocchiglia, Mayfly Ecology |
| **River** | Coolmine | **Date** | 07/08/2024 |
| **Site No.** | Site 3 Coolmine in park | **GPS** | 53.28056, -6.46084/ ITM 702641, 2726687 |

**Abbreviations**

| | | | |
|---|---|---|---|
| A: Austropotamobius pallipes | AX: Adult escaped | CP:Crayfish plague | Y: Female with young |
| J: Juvenile | JX: Juenile escaped | Z: Dead | GS: Old glair strands |
| F: Female | PD:Porcelain disease | B: Berried female | |

| Record No. | Species | Sex | CL (mm) | Damage | Disease | Breeding | Moult | Sub-site (Patch no.) | Catch method |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Standard search |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Additional Comments**

No crayfish were identified within the Coolmine stream at Site 3. The habitat conditions observed would indicate that this stream is not suitable to sustain a population of white-clawed crayfish. Water levels were shallow on the day of survey (0.1m) but not beyond the limits of crayfish as they can be found in streams as shallow as 0.05cm (Holdich, 2003). However, suitable refuges were lacking with an absence of boulders, woody debris, large cobbles, soft banks for burrowing and instream vegetation. Weirs downstream are a barrier for upward movement of crayfish.

# Crayfish Survey Card

| | | | |
|---|---|---|---|
| **Catchment** | Liffey | **Surveyor** | Letizia Cocchiglia, Mayfly Ecology |
| **River** | Camac | **Date** | 07/08/2024 |
| **Site No.** | Site 4 Camac River d/s metal bridge | **GPS** | 53.28027, -6.45410, ITM 703091, 726664 |

**Abbreviations**

A: Austropotamobius pallipes
AX: Adult escaped
CP:Crayfish plague
Y: Female with young
J: Juvenile
JX: Juenile escaped
Z: Dead
GS: Old glair strands
F: Female
PD:Porcelain disease
B: Berried female

| Record No. | Species | Sex | CL (mm) | Damage | Disease | Breeding | Moult | Sub-site (Patch no.) | Catch method |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Standard search |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Additional Comments**

No crayfish were identified within the Camac stream at Site 4. Physio-chemical conditions at the time of survey were supportive of crayfish. Moderate biological quality (Q3-4) was assigned. Cobbles, boulders, woody debris are commonly available forming good refuges for crayfish. However, instream vegetation was very limited, water depth was fairly shallow but not considered out of range for crayfish (0.2m). Flow was moderate to fast particularly in the shallow riffle areas. Slower moving areas with deeper pools were present but limited. The channel is constrained between high banks which likely results in fast flows in times of heavy rainfall. With no soft banks for burrowing or silted areas there is potentially a lack of suitable habitat crayfish can use to take refuge during flood events. Crayfish are either absent or present in such low numbers that the survey method did not detect them.

# Crayfish Survey Card

| | | | |
|---|---|---|---|
| **Catchment** | Liffey | **Surveyor** | Letizia Cocchiglia |
| **River** | Camac | **Date** | 08/08/2024 |
| **Site No.** | Site 5 Camac River near weir | **GPS** | 53.27908, -6.45361 / ITM 703127, 726533 |

**Abbreviations**

A: Austropotamobius pallipes
AX: Adult escaped
CP:Crayfish plague
Y: Female with young
J: Juvenile
JX: Juenile escaped
Z: Dead
GS: Old glair strands
F: Female
PD:Porcelain disease
B: Berried female

| Record No. | Species | Sex | CL (mm) | Damage | Disease | Breeding | Moult | Sub-site (Patch no.) | Catch method |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Standard search |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Additional Comments**

No crayfish were identified within the Camac stream at Site 5 which ran from downstream weir to just upstream of it. Physio-chemical conditions at the time of survey were supportive of crayfish. Moderate biological quality (Q3-4) was assigned at Site 4 downstream. Cobbles, boulders, woody debris are commonly available forming good refuges for crayfish and some instream vegetation .Water depth was shallow but not considered out of range for crayfish (0.25m) with some deeper section available. Flow was moderate to fast particularly in the shallow riffle areas. Slower moving areas with deeper pools were present but limited. The channel is constrained between high banks which likely results in fast flows in times of heavy rainfall. With no soft banks for burrowing or silted areas there is potentially a lack of suitable habitat crayfish can use to take refuge. during flood events. Dead crayfish and trout recorded here in 2023 after suspeceted polluiton event, IFI was notified and plague ruled out. Crayfish are either absent or present in such low numbers that the survey method did not detect them.

.

# Crayfish Survey Card

| | | | |
|---|---|---|---|
| **Catchment** | Liffey | **Surveyor** | Letizia Cocchiglia, Mayfly Ecology |
| **River** | Camac | **Date** | 27/09/2024 |
| **Site No.** | Site 6 Camac River at Slade Road Br. | **GPS** | 53.27508, -6.45045 / ITM 703347, 726092 |

**Abbreviations**

A: Austropotamobius pallipes
AX: Adult escaped
CP:Crayfish plague
Y: Female with young
J: Juvenile
JX: Juenile escaped
Z: Dead
GS: Old glair strands
F: Female
PD:Porcelain disease
B: Berried female

| Record No. | Species | Sex | CL (mm) | Damage | Disease | Breeding | Moult | Sub-site (Patch no.) | Catch method |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Standard search |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Additional Comments**

No crayfish were identified within the Camac at Site 6 . This is an EPA monitoring station and crayfish were identified in 2013. Physio-chemical conditions at the time of this survey were supportive of crayfish. EPA assigned Moderate biological quality (Q3-4) at this site in 2022 and a Q3-4 was assigned at Site 4 downstream in this 2024 survey. Cobbles and woody debris are commonly available forming good refuges for crayfish but no boulders were present. The only instream vegetation was 5% filamentous green algae but d/s of the nursing home there is 100% coverage in *Apium nodiflorum*. Water depth was shallow (0.15 -0.20m) and although sub-optimal not considered out of range for crayfish. Flow was moderate with riffle/glide only, no pools were present. The channel is constrained between high banks which likely results in fast flows in times of heavy rainfall. With no soft banks for burrowing or silted areas there is potentially a lack of suitable habitat crayfish can use to take refuge during flood events. Weir downstream is a barrier for upstream movement of crayfish. Crayfish are either absent or present in such low numbers that the survey method did not detect

# Crayfish Survey Card

| | | | |
|---|---|---|---|
| **Catchment** | Liffey | **Surveyor** | Letizia Cocchiglia, Mayfly Ecology |
| **River** | Swiftbrook Millpond (east) | **Date** | 28/09/2024 |
| **Site No.** | Site 7 Swiftbrook Millpond (east) | **GPS** | 53.279158, -6.4519787 / ITM 703236, 726544 |

**Abbreviations**

A: Austropotamobius pallipes
AX: Adult escaped
CP:Crayfish plague
Y: Female with young
J: Juvenile
JX: Juenile escaped
Z: Dead
GS: Old glair strands
F: Female
PD:Porcelain disease
B: Berried female

| Record No. | Species | Sex | CL (mm) | Damage | Disease | Breeding | Moult | Sub-site (Patch no.) | Catch method |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | Trapping (baited) |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |
| | | | | | | | | | |

**Additional Comments**

No crayfish were caught in any of the traps. Most of the pond is heavily vegetated with reedmace (*Typha latifolia*) with open water area mainly concentrated in the southern section of the pond and small pockets along margins. Other aquatic vegetation included reed canary grass (*Phalaris arundinacea*) and floating lesser duckweed (*Lemna minor*). Deep silted substrate is available and some woody substrate. Broadleaved trees overhang the banks. Five baited traps were deployed along the eastern, southern and western margins of the pond and left for 24hours.

# Crayfish Habitat Survey Card

| | | | |
|---|---|---|---|
| **Catchment** | Liffey | **Surveyor** | Letizia Cocchiglia, Mayfly Ecology |
| **River** | Camac | **Date/Time** | 07/08/2024, 16:00 |
| **Site No.** | Site 4 Camac River d/s metal bridge | **GPS** | 53.28027, -6.45410, ITM 703091, 726664 |

**General Information**

| | | | | | |
|---|---|---|---|---|---|
| **Weather:** | Good | **Water temp °C** | 16 | **Wet Width (m)** | 3 |
| **Flow:** | Low | **DO%, mg/l** | 90.1 ,8.77 | **Bank width (m)** | 3 |
| **Clarity:** | Clear | **pH** | 7.6 | **Survey length (m)** | 100 |
| **Method** | Standard | **Conductivity µs/cm** | 338 | | |

| | **Patch 1** | **Patch 2** | **Patch 3** | **Patch 4** | **Patch 5** |
|---|---|---|---|---|---|
| **Survey method** | Standard | Standard | Standard | Standard | Standard |
| **Extent (m x m)** | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 |
| **Channel area** | mid | mid | margin | mid | mid |
| **Depth (m)** | 0.20 | 0.20 | 0.20 | 0.30 | 0.20 |
| **Flow habitat** | Riffle/glide | Riffle/glide | Riffle/glide | Pool | Glide |
| **Refuges available in channel** | | | | | |
| (✓= present ✓✓ = main habitat) | | | | | |
| Cobble (6.5-15cm) | ✓✓ | ✓✓ | ✓✓ | ✓✓ | ✓✓ |
| Cobble (15-25.6cm) | ✓✓ | ✓✓ | ✓✓ | ✓✓ | ✓✓ |
| Boulder (25.6 -40cm) | ✓✓ | ✓✓ | ✓✓ | ✓✓ | ✓✓ |
| Boulder(>40cm) | | | | | |
| Rubble | | | | | |
| Woody debris | ✓ | ✓ | ✓ | | ✓ |
| Other urban debris | | | | | |
| Tree roots (fine) | | | | | |
| Moss | | | | | |
| Filamentous algae | | | | | |
| Submerged vegetation | | | | | |
| Emergents | | | | | |
| **Refuges available in bank** | | | | | |
| (✓= present ✓✓ = main habitat) | | | | | |
| None | | | | | |
| Cobble/bouler | | | | | |
| Tree roots (large) | ✓ | ✓✓ | | | |
| Undercut | ✓ | ✓ | ✓ | | ✓ |
| Stonewall | | | | | |
| Other reinforced | | | | | |
| Burrows | | | | | |
| **% Substrate** | | | | | |
| Bedrock | | | | | |
| Boulder | 2 | 2 | 2 | 2 | 2 |
| Cobble | 35 | 35 | 35 | 35 | 35 |
| Coarse gravel | 30 | 30 | 30 | 30 | 30 |
| Fine gravel | 25 | 25 | 25 | 25 | 25 |
| Sand | 3 | 3 | 3 | 3 | 3 |
| Silt | 5 | 5 | 5 | 5 | 5 |
| **Siltation (none, low, mod, high)** | Low-mod | Low-mod | Low-mod | Low-mod | Low-mod |
| **%Shading** | 65% | 65% | 20% | 20% | 20% |

# Crayfish Habitat Survey Card

| | | | |
|---|---|---|---|
| **Catchment** | Liffey | **Surveyor** | Letizia Cocchiglia, Mayfly Ecology |
| **River** | Camac | **Date/Time** | 08/08/2024, 10:00 |
| **Site No.** | Site 5 Camac River near weir | **GPS** | 53.27908, -6.45361 / ITM 703127, 726533 |

**General Information**

| | | | | | |
|---|---|---|---|---|---|
| **Weather:** | Good | **Water temp °C** | 16.5 | **Wet Width (m)** | 2.5 |
| **Flow:** | Low | **DO%, mg/l** | 95.1, 9.01 | **Bank width (m)** | 2.5 |
| **Clarity:** | Clear | **pH** | 7.94 | **Survey length (m)** | 100 |
| **Method** | Standard | **Conductivity µs/cm** | 387 | | |

| | **Patch 1** | **Patch 2** | **Patch 3** | **Patch 4** | **Patch 5** |
|---|---|---|---|---|---|
| **Survey method** | Standard | Standard | Standard | Standard | Standard |
| **Extent (m x m)** | 1x2 | 1x2 | 1x2 | 1x2 | 1x2 |
| **Channel area** | mid | margins | mid/margin | mid | mid |
| **Depth (m)** | 0.35 | 0.30 | 0.15 | 0.20 | 0.25 |
| **Flow habitat** | glide/pool | glide | glide | glide | glide |
| | | | | | |
| **Refuges available in channel** | | | | | |
| (✓= present ✓✓ = main habitat) | | | | | |
| Cobble (6.5-15cm) | ✓✓ | ✓✓ | ✓✓ | ✓✓ | ✓✓ |
| Cobble (15-25.6cm) | ✓✓ | ✓✓ | ✓✓ | ✓✓ | ✓✓ |
| Boulder (25.6 -40cm) | ✓✓ | ✓✓ | ✓✓ | ✓✓ | ✓✓ |
| Boulder(>40cm) | | | | | |
| Rubble | | | | | |
| Woody debris | ✓ | ✓ | ✓ | | ✓ |
| Other urban debris | | | | | |
| Tree roots (fine) | | | | | ✓ |
| Moss | | | | | ✓ |
| Filamentous algae | | | | | |
| Submerged vegetation | | | | | |
| Emergents | | | | ✓ | ✓ |
| | | | | | |
| **Refuges available in bank** | | | | | |
| (✓= present ✓✓ = main habitat) | | | | | |
| None | | | | | |
| Cobble/bouler | | | | | |
| Tree roots (large) | ✓ | ✓ | | | |
| Undercut | | ✓ | ✓ | | |
| Stonewall | | | | | |
| Other reinforced | | | | | |
| Burrows | | | | | |
| | | | | | |
| **% Substrate** | | | | | |
| Bedrock | | | | | |
| Boulder | 2 | 2 | 2 | 2 | 2 |
| Cobble | 35 | 35 | 35 | 35 | 35 |
| Coarse gravel | 30 | 30 | 30 | 30 | 30 |
| Fine gravel | 25 | 25 | 25 | 25 | 25 |
| Sand | 3 | 3 | 3 | 3 | 3 |
| Silt | 5 | 5 | 5 | 5 | 5 |
| | | | | | |
| **Siltation (none, low, mod, high)** | Low-mod | Low-mod | Low-mod | Low-mod | Low-mod |
| **%Shading** | 65% | 65% | 65% | 65% | 50% |

# Crayfish Habitat Survey Card

| | | | |
|---|---|---|---|
| **Catchment** | Liffey | **Surveyor** | Letizia Cocchiglia, Mayfly Ecology |
| **River** | Camac | **Date** | 27/09/2024, 15:00 |
| **Site No.** | Site 6 Camac River at Slade Road Br. | **GPS** | 53.27508, -6.45045 / ITM 703347, 726092 |

**General Information**

| | | | | | |
|---|---|---|---|---|---|
| **Weather:** | Good | **Water temp °C** | 11.6 | **Wet Width (m)** | 2.5 |
| **Flow:** | Normal | **DO%, mg/l** | 97.7, 10.5 | **Bank width (m)** | 3 |
| **Clarity:** | Clear | **pH** | 7.85 | **Survey length (m)** | 100 |
| **Method** | Standard | **Conductivity µs/cm** | 457 | | |

| | **Patch 1** | **Patch 2** | **Patch 3** | **Patch 4** | **Patch 5** |
|---|---|---|---|---|---|
| **Survey method** | Standard | Standard | Standard | Standard | Standard |
| **Extent (m x m)** | 2x2 | 2x2 | 2x2 | 2x2 | 2x2 |
| **Channel area** | mid | mid/margin | mid | mid | mid/margin |
| **Depth (m)** | 0.15 | 0.15 | 0.15 | 0.20 | 0.25 |
| **Flow habitat** | riffle | riffle/glide | glide | riffle/glide | glide |
| | | | | | |
| **Refuges available in channel** | | | | | |
| (✓= present ✓✓ = main habitat) | | | | | |
| Cobble (6.5-15cm) | ✓✓ | ✓✓ | ✓✓ | ✓✓ | ✓✓ |
| Cobble (15-25.6cm) | ✓ | ✓✓ | ✓✓ | ✓✓ | ✓✓ |
| Boulder (25.6 -40cm) | ✓✓ | ✓✓ | ✓✓ | ✓✓ | ✓✓ |
| Boulder(>40cm) | | | | | |
| Rubble | | | | | |
| Woody debris | ✓ | ✓ | ✓ | | ✓ |
| Other urban debris | | | | | |
| Tree roots (fine) | | | | | ✓ |
| Moss | | | | | ✓ |
| Filamentous algae | | | | | |
| Submerged vegetation | | | | | |
| Emergents | | | | ✓ | ✓ |
| | | | | | |
| **Refuges available in bank** | | | | | |
| (✓= present ✓✓ = main habitat) | | | | | |
| None | | | | | |
| Cobble/bouler | | | | | |
| Tree roots (large) | ✓ | ✓ | | | |
| Undercut | | ✓ | ✓ | | |
| Stonewall | | | | | |
| Other reinforced | | | | | |
| Burrows | | | | | |
| | | | | | |
| **% Substrate** | | | | | |
| Bedrock | 0 | 0 | 0 | 0 | 0 |
| Boulder | 1 | 1 | 1 | 1 | 1 |
| Cobble | 44 | 44 | 44 | 44 | 44 |
| Coarse gravel | 35 | 35 | 35 | 35 | 35 |
| Fine gravel | 18 | 18 | 18 | 18 | 18 |
| Sand | 0 | 0 | 0 | 0 | 0 |
| Silt | 2 | 2 | 2 | 2 | 2 |
| | | | | | |
| **Siltation (none, low, mod, high)** | Low | Low | Low | Low | Low |
| **%Shading** | 10% | 10% | 0% | 0% | 0% |

# Crayfish Habitat Survey Card

| | | | |
|---|---|---|---|
| **Catchment** | Liffey | **Surveyor** | Letizia Cocchiglia, Mayfly Ecology |
| **River** | Swiftbrook Millpond (east) | **Date** | 28/09/2024, 08:00 |
| **Site No.** | Site 7 Swiftbrook Millpond (east) | **GPS** | 53.279158, -6.4519787 / ITM 703236, 726544 |

**General Information**

| | | | | | |
|---|---|---|---|---|---|
| **Weather:** | Good | **Water temp °C** | 10.8 | **Wet Width (m)** | |
| **Flow:** | Low | **DO%, mg/l** | 93.7,10.4 | **Bank width (m)** | |
| **Clarity:** | Clear | **pH** | 8.02 | **Survey length (m)** | |
| **Method** | Trapping (baited) | **Conductivityµs/cm** | 421 | | |

| | **Patch 1** | **Patch 2** | **Patch 3** | **Patch 4** | **Patch 5** |
|---|---|---|---|---|---|
| **Survey method** | Trapping (bait) | Trapping (bait) | Trapping (bait) | Trapping (bait | Trapping (bait) |
| **Extent (m x m)** | swedish trap | swedish trap | swedish trap | swedish trap | swedish trap |
| **Channel area** | margin | margin | margin | margin | margin |
| **Depth (m)** | 0.30 | 0.30 | 0.30 | 0.30 | 0.30 |
| **Flow habitat** | pond | pond | pond | pond | pond |
| **Refuges available in channel** | | | | | |
| (✓= present ✓✓ = main habitat) | | | | | |
| Cobble (6.5-15cm) | | | | | |
| Cobble (15-25.6cm) | | | | | |
| Boulder (25.6 -40cm) | | | | | |
| Boulder(>40cm) | | | | | |
| Rubble | | | | | |
| Woody debris | ✓ | ✓ | ✓ | ✓ | ✓ |
| Other urban debris | | | | | |
| Tree roots (fine) | | | | | |
| Moss | | | | | |
| Filamentous algae | | | | | |
| Submerged vegetation | | | | | |
| Emergents | ✓✓ | ✓✓ | ✓✓ | ✓✓ | ✓✓ |
| **Refuges available in bank** | | | | | |
| (✓= present ✓✓ = main habitat) | | | | | |
| None | | | | | |
| Cobble/bouler | | | | | |
| Tree roots (large) | | | | | |
| Undercut | | | | | |
| Stonewall | | | | | |
| Other reinforced | | | | | |
| Burrows | soft bank | soft bank | soft bank | soft bank | soft bank |
| **% Substrate** | | | | | |
| Bedrock | | | | | |
| Boulder | | | | | |
| Cobble | | | | | |
| Coarse gravel | 10 | 10 | 10 | 10 | 10 |
| Fine gravel | 10 | 10 | 10 | 10 | 10 |
| Sand | | | | | |
| Silt | 80 | 80 | 80 | 80 | 80 |
| **Siltation (none, low, mod, high)** | High | High | High | High | High |
| **%Shading** | 10% | 10% | 10% | 10% | 10% |