Introduction

This report captures a full year citizen science survey of the Ahare River and Estuary. The survey was undertaken by Cathy Lee, Castletown, Co. Wexford with support and advice from Karen Dubsky from Coast Watch Ireland and the Local Authorities Waters Programme (LAWPRO).

The survey was undertaken from September 2019 to September 2020 and focused on the biodiversity, water quality and river levels at two locations in the lower section of the Ahare /Inch River Catchment; namely Ahare Bridge (52°43'00.4"N 6°11'15.8"W) and the mouth of the Ahare River on Clone Beach, north County Wexford.

This volunteer project aims to build on the existing data for the Ahare/ Inch River. Over the course of a year daily site visits were conducted and observations were recorded. It is hoped that through these basic observations and scientific techniques, the ecological integrity and value and variety of the local biodiversity of the river may be gauged.

Ahare /Inch River Catchment

The Ahare /Inch River is located in north County Wexford and belongs to the Owenavorragh catchment (hydrometric area). The Ahare River Catchment borders the Ballyduff Stream/ Avoca River Catchment to the North, the Bann River Catchment to the West, and the Banoge/ Owenavorragh River Catchment to the South.

There are two main sources of the Ahare/ Inch River Catchment; the Clonough Stream to the North West and the Inch Stream to the South West. The Clonough Stream originates in the eastern slopes of the Slievefoore Hill (466m) on the Wexford/ Wicklow Border along with its sister, the Askinch upper stream. These both flow through farmland and woodland areas, including Newtown Wood and Shirsheen Woods, before passing either side of Coolgreany Village and joining together just upstream of the Rosslare railway line at Ballylarkin.

The Inch Stream originates from three smaller tributaries, the Gorteen Upper Stream from Rathpierce and Ballyfad, Inch Upper Stream from Pallas Hill, and the Kilanerin Stream which flows through Curragh Wood. These streams come together to make the Inch Stream as it flows predominantly in a west to east direction

The main Ahare/ Inch River channel forms when these two main tributaries join at Monalug Townland, north of Castletown and from there it flows in a mainly easterly the Irish Sea close to Castletown, north Co. Wexford (EPA Maps, [https://gis.epa.ie/EPAMaps/Water, 12:00 14-12-2021).

Ahare Bridge

The Ahare Bridge is situated on the boundary between Ahare and Clones Upper Townlands near Castletown village. The bridge is approximately 1.5km upstream of the mouth of the Ahare/ Inch River Catchment at Clone Beach. The surrounding area is historically mapped as a low-lying floodplain and quite regularly floods, including the local coastal road. The tidal influence ends just upstream of the Ahare Bridge.

Figure 1: View from Ahare Bridge, looking upstream/ west (Dónal O'Keeffe, 2021)

Ahare River Estuary

The Ahare/ Inch River enters the Irish Sea at Clone Beach in the Kilgorman Townland, north Co. Wexford. The final course of the river is strongly affected by longshore drift northwards along the coast, which often creates a large sand bar along the river mouth. This normally forces the river to flow in a northerly direction along the beach before discharging to the Irish Sea.

This is a common pattern for a number of rivers on this part of the east coast, as the sediment forming the sandbar/spit is moving northwards under the prevailing southwest winds (Johnston, 2018, Flooding on the lower river inch, Wexford)

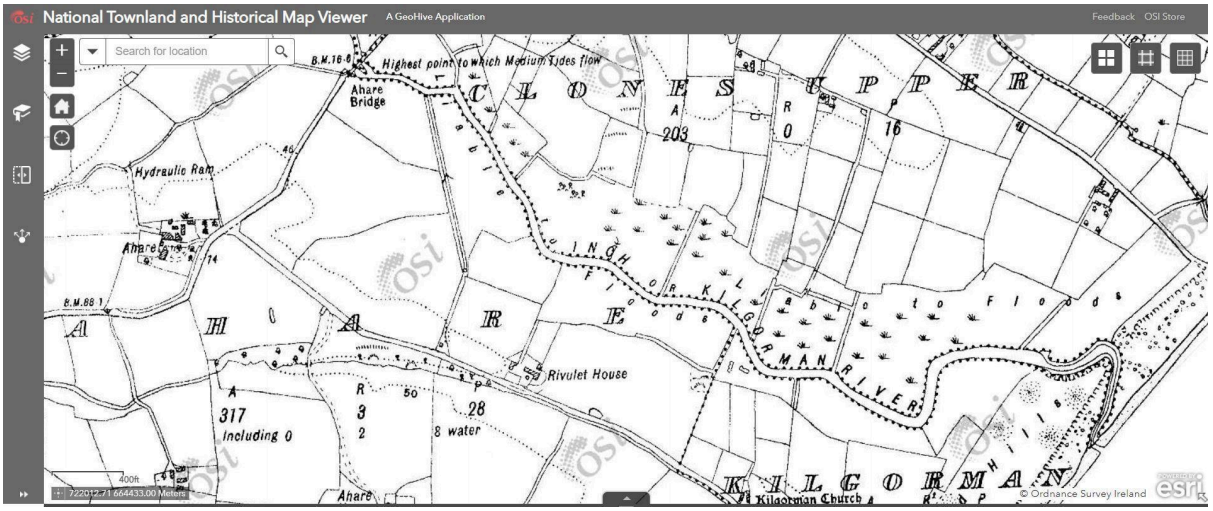


Figure 2: Ahare/ Inch River [OSI Map Viewer, https://geohive.maps.arcgis.com/apps/webappviewer 05-01-2022 09.15pm]

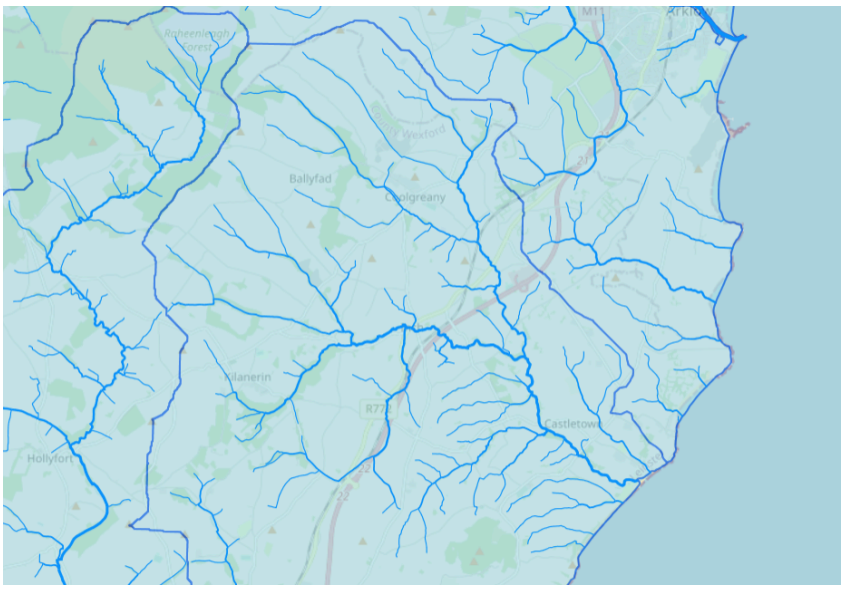


Figure 3: Ahare/ Inch River Catchment [https://gis.epa.ie/EPAMaps/Water, 14-12-2021, 12:00]

Materials and Methods

Field Monitoring

From October 2019 - September 2020, daily site visits were conducted at both locations and observations on wildlife, water quality and water level/flooding were documented onsite and noted in an excel worksheet template (developed by Coastwatch) by date. The same amount of time per day was spent, this was about an hour. All observations recorded in the excel spreadsheet were made at the bridge (Figure 4). Observations at the second monitoring site were recorded via a picture series. Key events from this site are included in appendix a.

Figure 4: Location map of monitoring sites.

Water Level monitoring was carried out daily, and the water level assessments were based upon the level of the river in comparison to 1. the bridge, 2. fixed objects emanating from the riverbed and 3. the river banks up and downstream of the bridge. The water levels were recorded on an arbitrary depth scale between 1-5 with the level 1 being unusually low, the base level of the river was set at 3 and level 5 being the highest levels or flood situation.

AS44

	A	B	C	D	E	F	G	H	I	J	K	L	M
1	Site	Date	Time	Tide	Colour	Transparenc	Foam	Depth at m	Biota in wat	Biota near b	Biota on We	Halls land Fl	Roches Land
2	Bridge	01-Oct-19	9.05am		Green Hue	Cloudy	No	5				2	2
3	Bridge	02-Oct-19	10.50am		Green Hue	Cloudy	No	4				2	1
4	Bridge	03-Oct-19	4.03pm		Green Hue	Cloudy	No	5				2	1
5	Bridge	04-Oct-19	9.05am		Green Hue	Cloudy	No	4				2	2
6	Bridge	05-Oct-19	1.54pm	5.13am+5.3	Green Hue	Cloudy	No	5				2	2
7	Bridge	06-Oct-19	2.06pm	6.24am+5.3	Green Hue	Cloudy	No	4				2	1
8	Bridge	07-Oct-19	10.30am	7.42am+8pr	Green Hue	Cloudy	No	4				1	1
9	Bridge	08-Oct-19	11am		Gren/Bown	Cloudy	No	3				2	1
10	Bridge	09-Oct-19	3.15pm		Green Hue	Cloudy	No	3				1	1
11	Bridge	10-Oct-19	4.50pm	7.55am+8.0	Green Hue	Cloudy	No	3				1	1
12	Bridge	11-Oct-19	4.57pm	8.37pm	Green Hue	Cloudy	No	3		Heron		1	1
13	Bridge	12-Oct-19	2.30pm	9.11pm	Green Hue	Cloudy	No	3				1	1
14	Bridge	13-Oct-19	12.36pm	9.43am	Muddy Brov	Cloudy	No	5				2	2
15	Bridge	14-Oct-19	10am	9.47am+9.5	Muddy Brov	Cloudy	No	4			Mallard duc	1	1
16	Bridge	15-Oct-19	11.15am	9.55pm	Green Hue	Cloudy	No	3				1	1
17	Bridge	16-Oct-19	4pm	10.21am+10	Green Hue	Cloudy	No	3				1	1
18	Bridge	17-Oct-19	1.50pm	2.02am+2.2	Green Hue	Very Cloudy	No	4				1	1
19	Bridge	18-Oct-19	3.15pm		Green/ Brov	Cloudy	No	4			Mallard Duc	2	1
20	Bridge	19-Oct-19	2.50pm	12.41pm	Green Hue	Cloudy	No	4		Heron+Mall	4approx Dai	2	1
21	Bridge	20-Oct-19	12.50pm	1.40pm	Green Hue	Cloudy	No	3			Mallard duc	1	1

Figure 5: Excel worksheet template

The flow direction and an approximate flow speed were observed and noted along with recording the Courtown tidal times. A scale of how flooded or wet the floodplain was (i.e. waterlogged, land flooded) was also noted on a scale of 1-3 as shown in Figure 6. Transparency and colouration of the river and of a bucket sample of water was also noted.

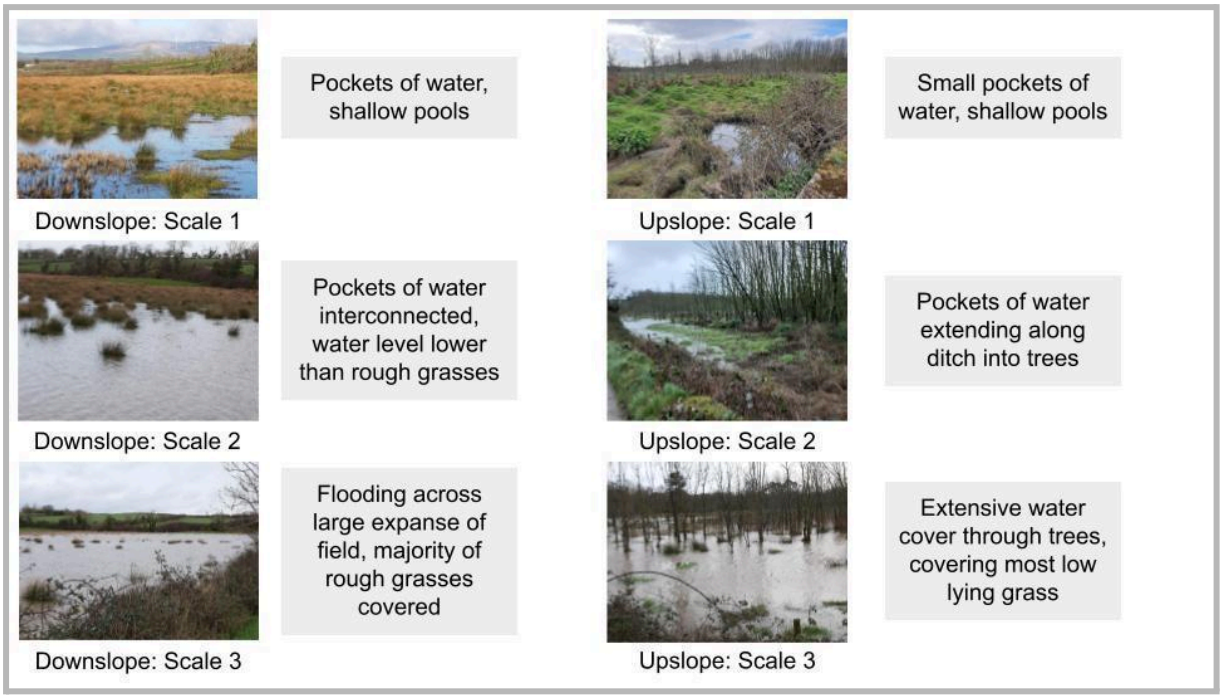


Figure 6: Criteria used to assess flooding of the wetland on a 1-3 scale. Examples shown from upslope and downslope land on either side of the river.

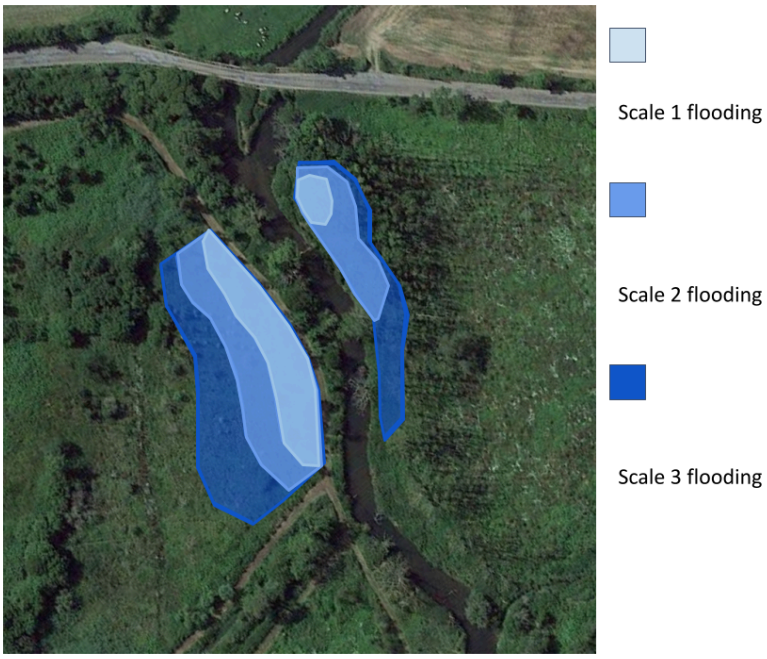


Figure 7: Aerial photograph demonstrating 1-3 flood scale

Biodiversity monitoring conducted at Ahare Bridge noted biota, 1. in or on the water, 2. near the waters edge and 3. on the floodplain.

A photograph of each location was also taken for the vast majority of the survey occasions.

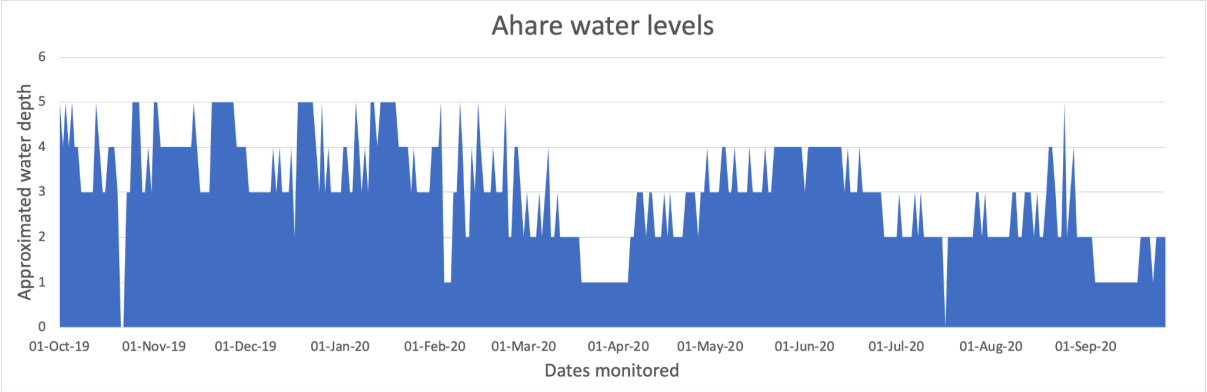
Nitrate Monitoring

Merckoquant Nitrat-Test strips were used to gauge nitrate concentration within the river. Nirat-Test enable nitrate concentration to be estimated in a water sample on a scale of 0-500 mg/l. The strip was immersed in a water sample from the river for one second. Excess liquid was removed off the strip and then the colour result compared with the colour scale on the kit after 1 minute. The nitrate concentration was then recorded.

Results

Water Levels and Flooding

The river depth was monitored daily and Chart 1 below shows the trend from August 2019 to September 2020.



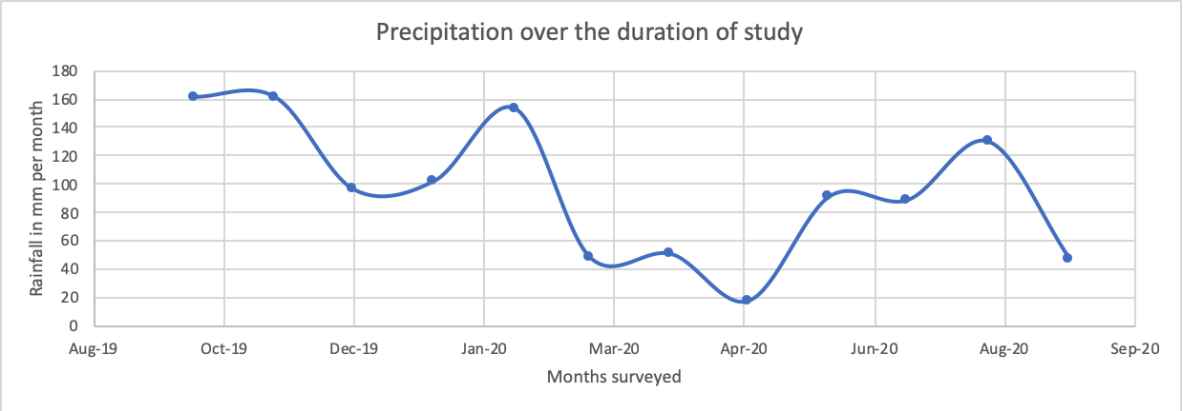


Chart 1: A simplified graph of the water level average at the Ahare Bridge and the rainfall in the Wexford region (taken at Johnstown) for the duration of the survey. These trends are described in chart 1a . Rainfall data taken from MetEireann (https://www.met.ie/climate/available-data/monthly-data)

Between the months of February and April, precipitation was at its lowest in the Wexford area for that year.

A landward flow vs seaward flow was observed at the bridge along with water level. As shown below in Chart 3, on approximately ⅓ of days in both April and May the flow was landward. It should be noted that an unauthorised cut out of the river was carried out in February, with the aim of lowering the water level by facilitating flow to the sea, which may have influenced the water levels at this time of year.

Picture 1 (left) taken 3rd February, showing ~14ft high, unstable sandbanks following the cut out. Picture 2 (right) shows remnant of original estuary in the foreground with the manmade, direct route to sea visible in the background (photos courtesy of Cathy Lee)

Immediately following these works, the river has demonstrated increased landward flow, showing the strongest tidal influence that was seen throughout this study. As shown below in chart 2, this has resulted in a significant temporary decrease in water level. The water level of the river returned to a stasis with precipitation levels by late February.

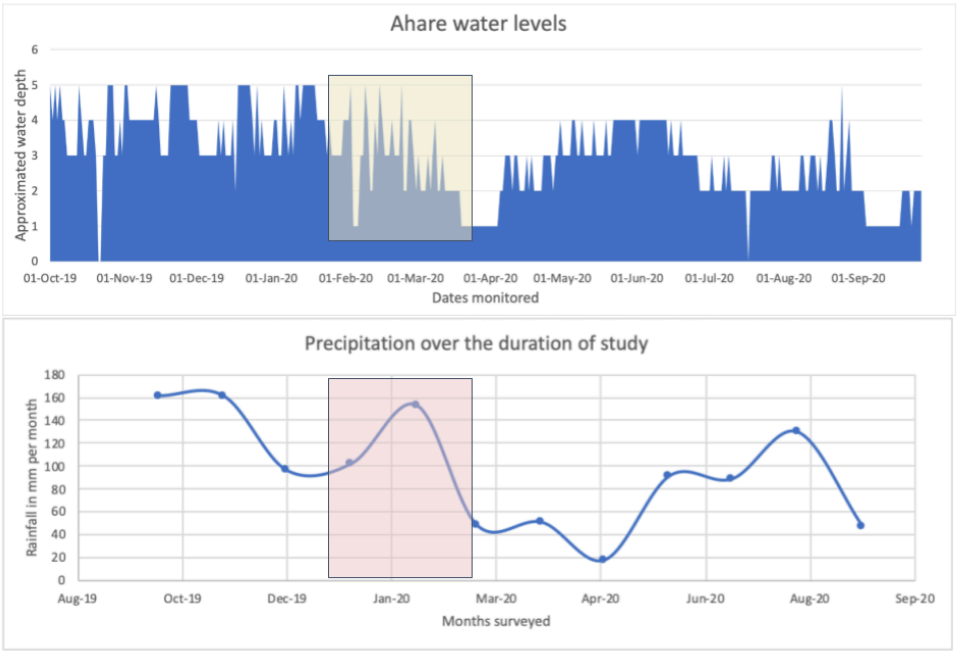


Chart 2: Highlighted in yellow: the excavation works initially decreased water levels inland. The Ahare rapidly adjusts inland, and water levels follow the overarching trend which agrees with precipitation levels. Highlighted in red: The precipitation levels during the excavation works and immediately after.

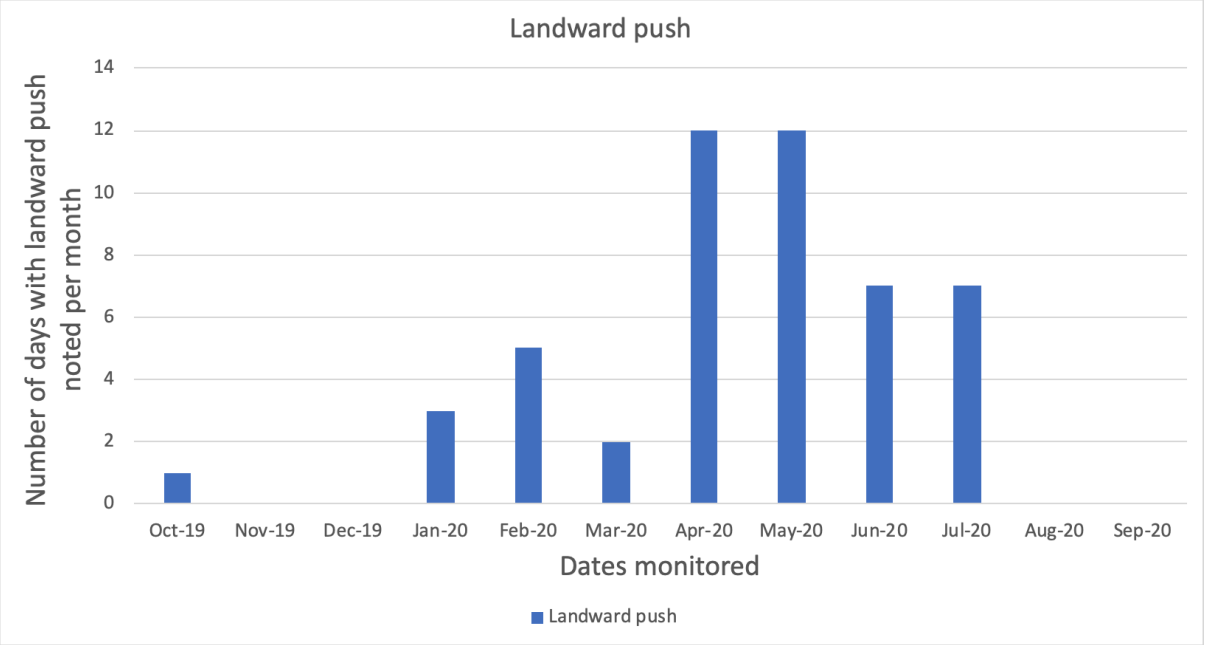


Chart 3: Number of days each month with landward push noted. Highest occurrence coincides with the lowest periodic water level shown in chart 1.

As shown in chart 3, the months with the most landward push coincide with the water level decrease in April shown in chart 1. The river shows signs of tidal influence throughout the year but there is a significant increase shown when inland water levels drop.

Wetland Flooding

The wetland area surrounding the Ahare is regularly flooded. This flooding was monitored and ranked as described in methods. The land was divided into upslope and downslope land, each area was given a separate ranking daily. Naturally as the water level of the Ahare rose, the flooding in the adjacent land worsened. This was not, however, concurrent year round.

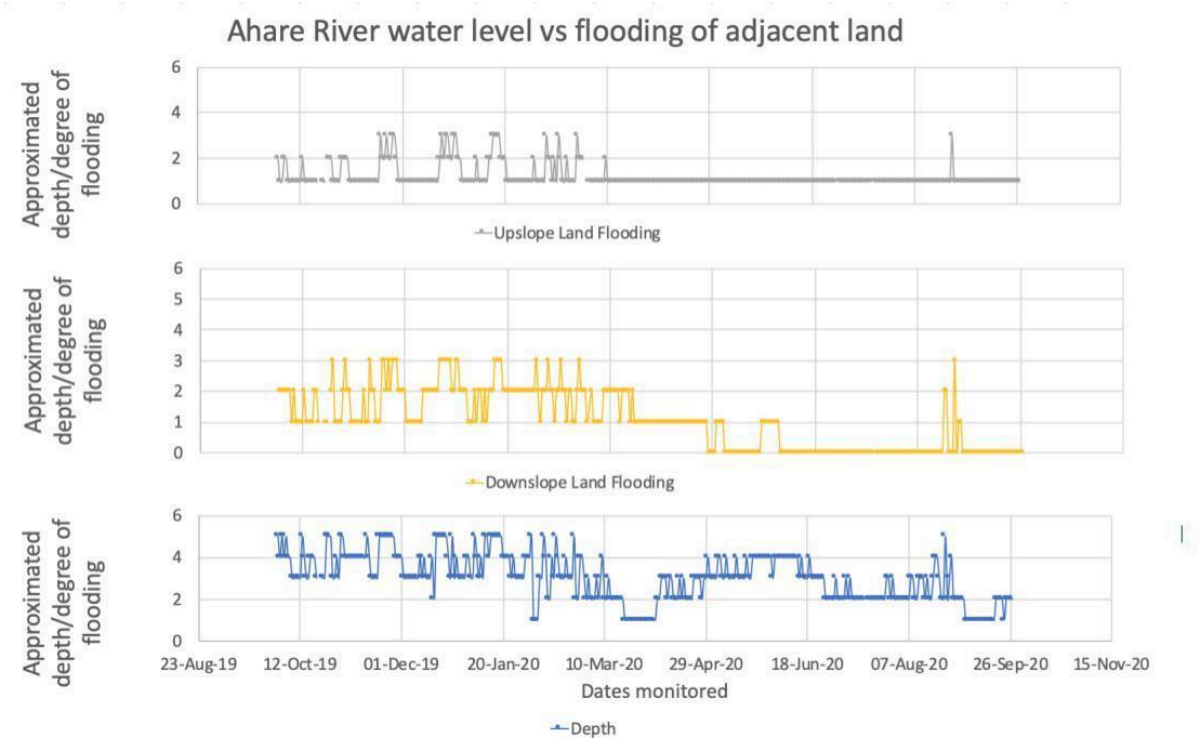


Chart 4: Trendlines for water level (depth) and flooding of adjacent land separated to highlight summer vs winter flooding. Note similar trends in the first half of the study.

As outlined in chart 4 these high water levels result in flooding of surrounding land in autumn-spring months. At the first major trough in the depth graph, (highlighted in chart 4a in the discussion) in March, a drop in water level is observed in the land adjacent. While the water level in the river increases and fluctuates for the remainder of the study, this trough marks the end of the flooding season for the wetlands.

Road flooding is a consistent issue around the Ahare, a record was made in this study of the dates that the road flooded, and the dates that this flooding resulted in the road being impassable. A full record of this data is included in appendix b.

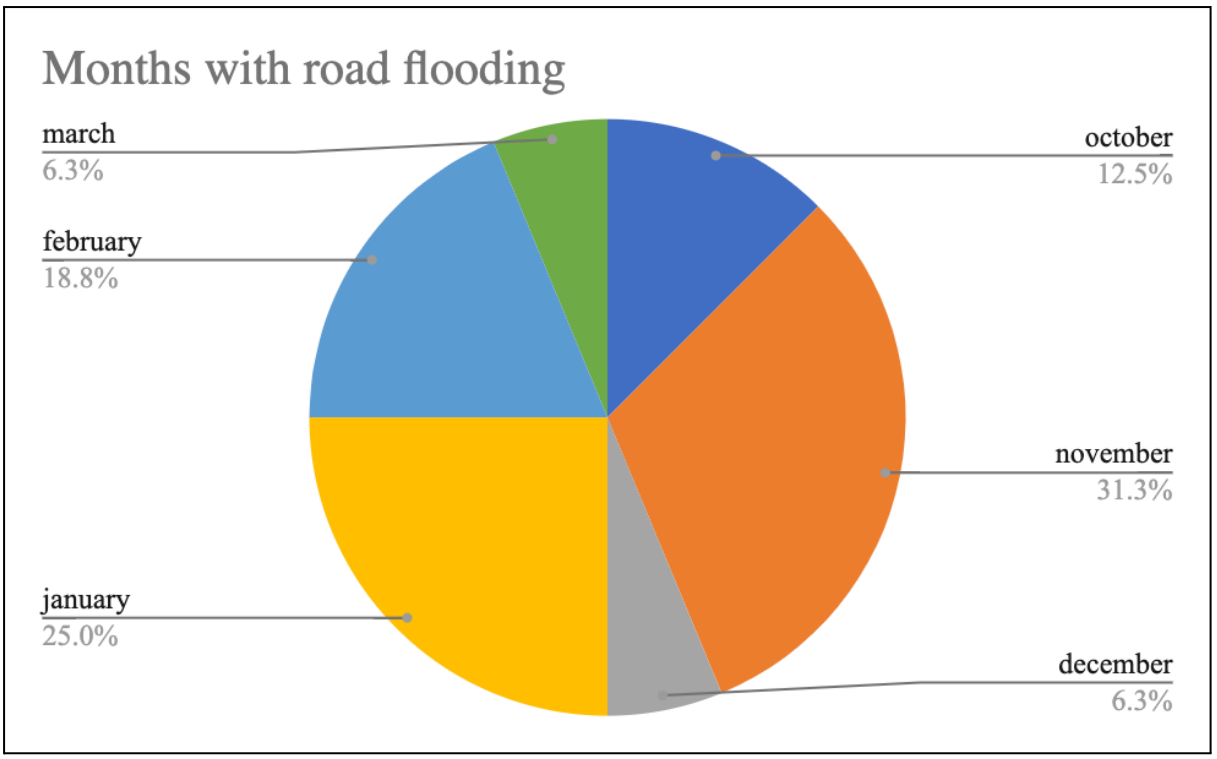


Chart 5a: The road did not flood during 6 months of the studied year. Flooding was limited to the colder months. Slice size represents number of days, 16 total.

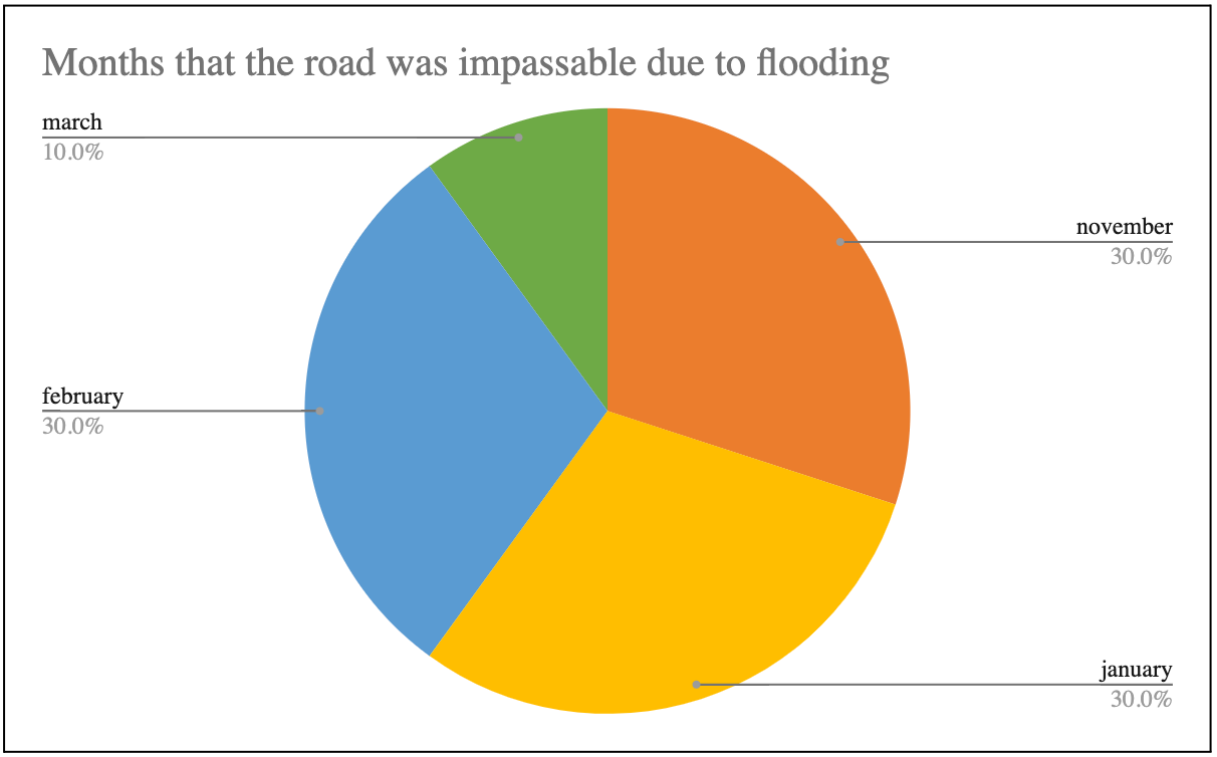


Chart 5b: Flooding resulted in impassable road conditions on multiple occasions during four out of the six flooded months. Slice size represents number of days, 10 total.

The road flooded during the colder six months of the year, from October to March. During this time, the road flooded for a total of sixteen days. The road was impassable on ten occasions to all vehicles except tractors.

Water Quality

The current Water Framework Directive (WFD) Status of the Inch (Ahare) is Moderate (EPA 2013-2018) and the catchment is considered 'at risk' of not achieving good status in the 3rd River Basin Management Plan 2022-2027.

Evaluation of the Gorteen Steam, a tributary of the Inch River, was found to have declined from good to moderate status, while evaluation by the EPA of the Clonough and Akinch tributaries determined their status to be poor. The rivers within the Inch subcatchment were all found to be at risk in accordance with Water Framework Derivatives (WFD). Pressures on the Inch River include domestic waste water, agriculture and industry (EPA. 2019)

Ecology

A record of animal sightings directly on the river, in the vicinity and on the surrounding wetlands were recorded separately. Observations of biota on the wetland included the presence of animals nearby (on the riverbanks, or on land surrounding the wetland), birds flying overhead and farm stock. As the wetland area is being considered in this report in terms of its ecological significance, any sightings that were not directly on the wetland were discounted, as were farm stock. It is worth noting that wild animal traffic is heavier in reality than indicated in the graph below, as a result of these omissions.

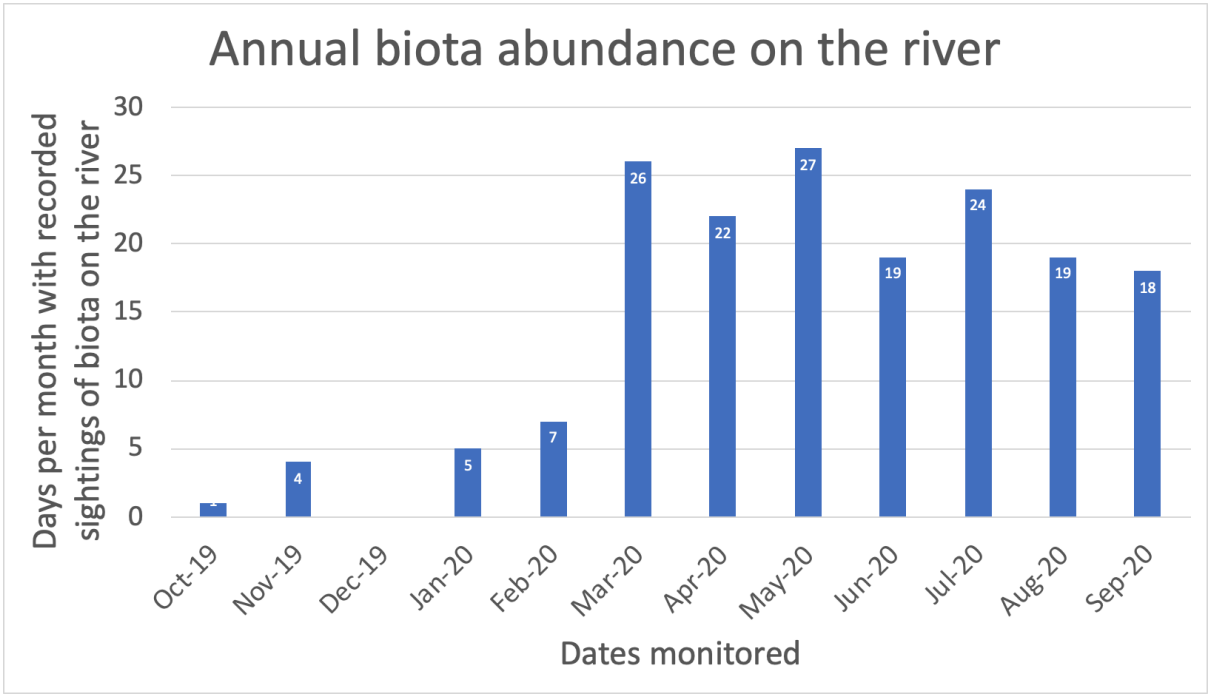


Chart 6a: Days per month with recorded biota on water - not taking into account number of individuals or species.

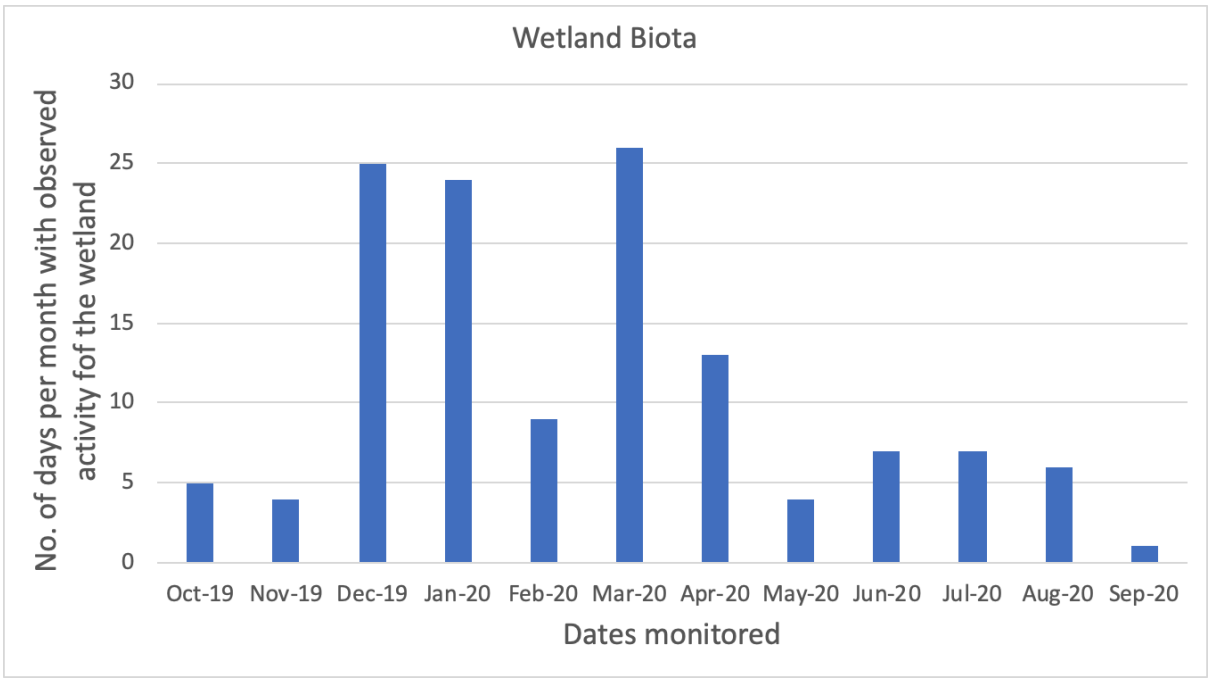
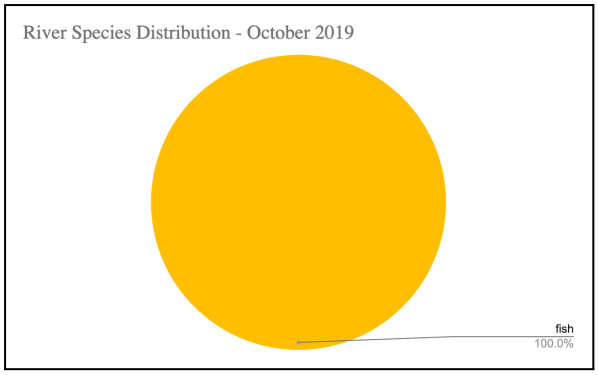
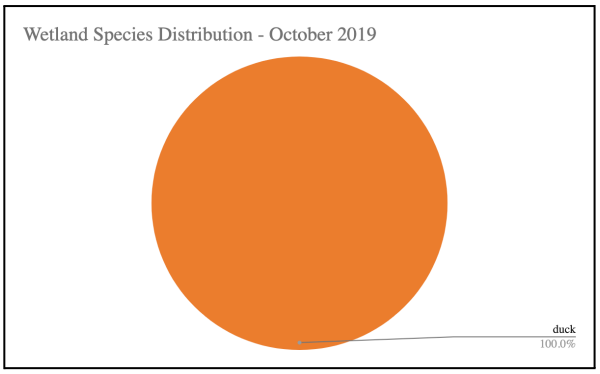
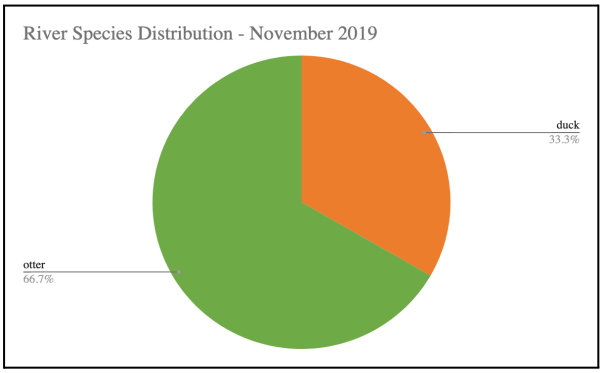


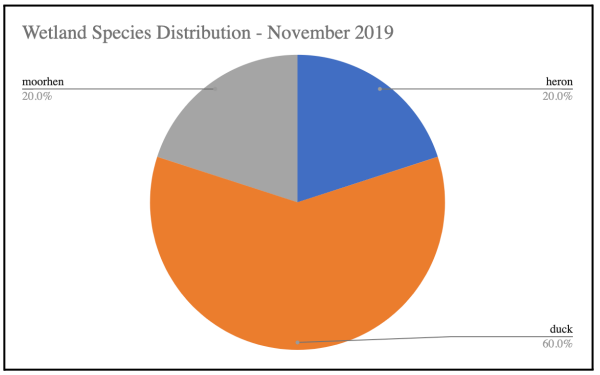
Chart 6b: Days per month with recorded biota on the wetland. Animal activity on the wetland was lowest in summer.

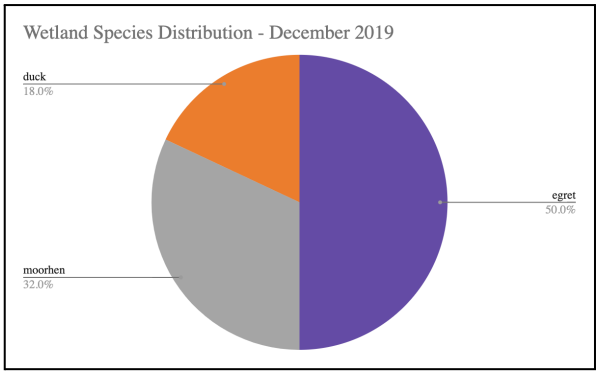
As well as abundance, variety of species observed in different habitats along the Ahare was documented in detail. The species distribution plots below show seasonal changes in the biota observed during this study in two habitats.

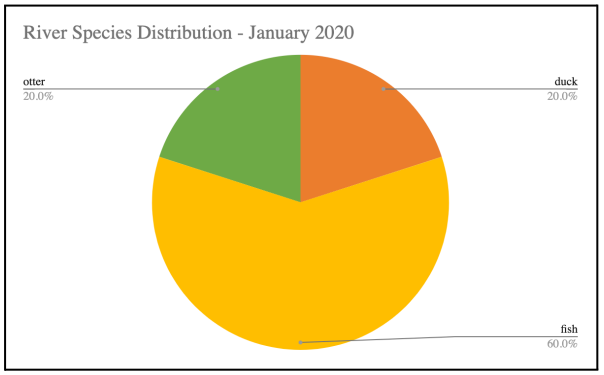

River Species Distribution - October 2019
fish
100.0%

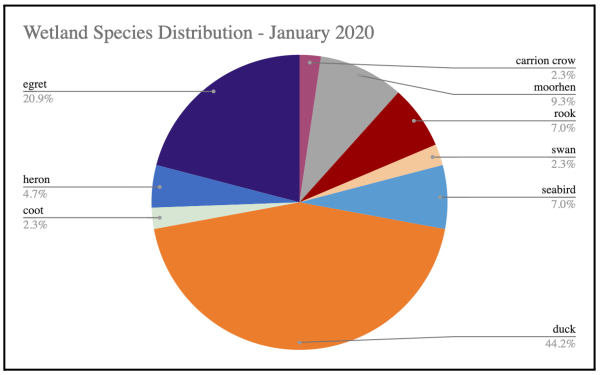

Wetland Species Distribution - October 2019
duck
100.0%

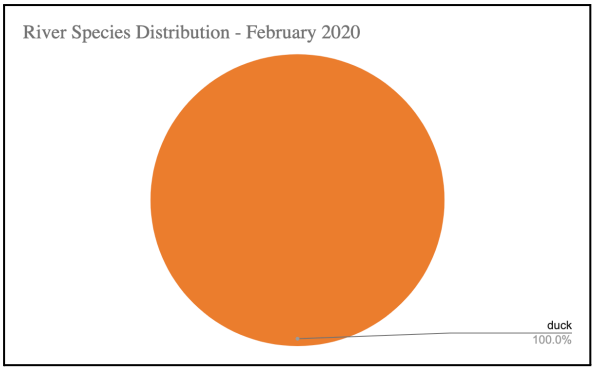

River Species Distribution - November 2019
duck
33.3%
otter
66.7%

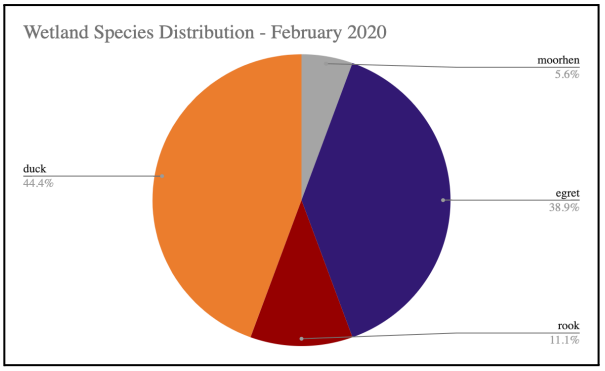

Wetland Species Distribution - November 2019
moorhen
20.0%
heron
20.0%
duck
60.0%

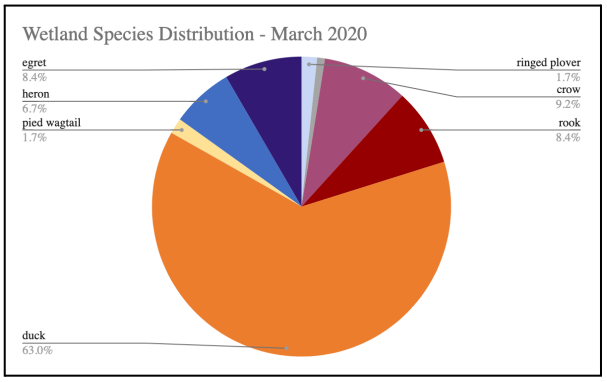

Wetland Species Distribution - December 2019
duck
18.0%
egret
50.0%
moorhen
32.0%

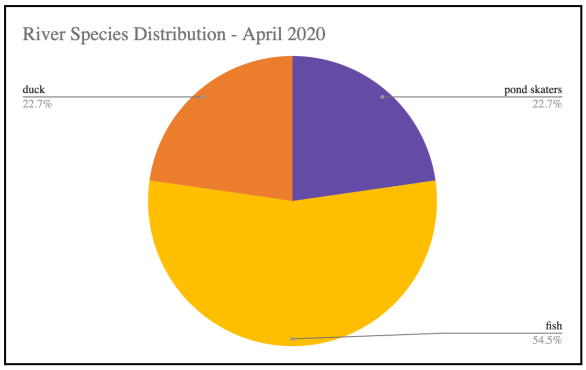

River Species Distribution - January 2020
otter
20.0%
duck
20.0%
fish
60.0%

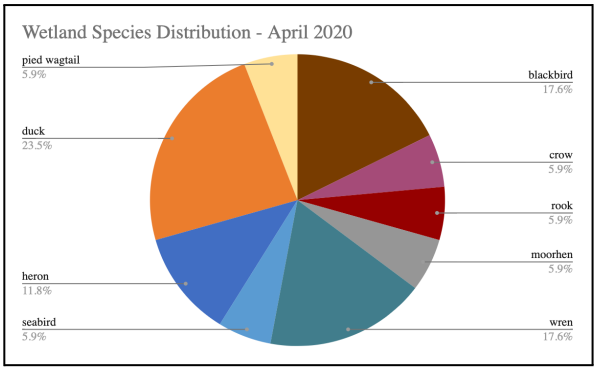

Wetland Species Distribution - January 2020
carrion crow
2.3%
moorhen
9.3%
rook
7.0%
swan
2.3%
seabird
7.0%
egret
20.9%
heron
4.7%
coot
2.3%
duck
44.2%

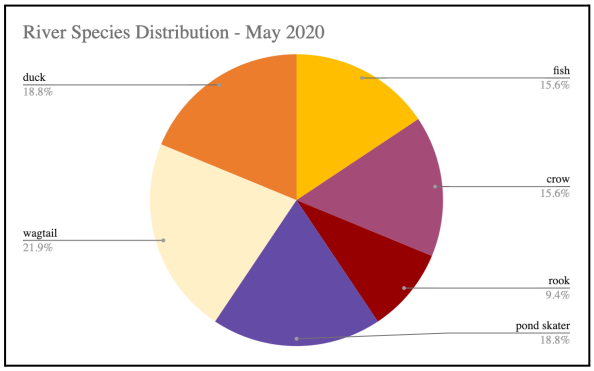

River Species Distribution - February 2020
duck
100.0%

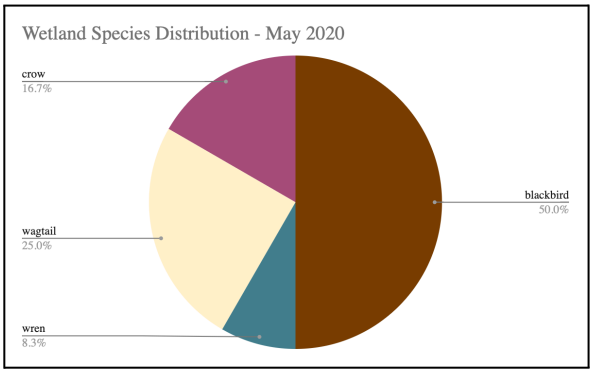

Wetland Species Distribution - February 2020
moorhen
5.6%
duck
44.4%
egret
38.9%
rook
11.1%

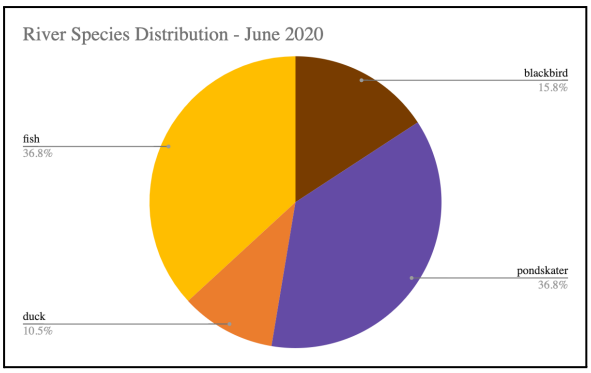

Wetland Species Distribution - March 2020
egret
8.4%
ringed plover
1.7%
heron
6.7%
crow
9.2%
pied wagtail
1.7%
rook
8.4%
duck
63.0%

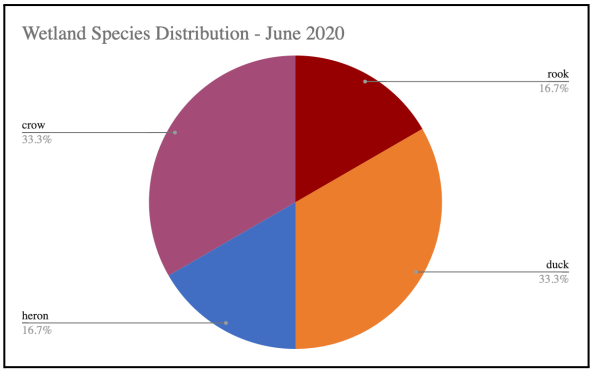

River Species Distribution - April 2020
duck
22.7%
pond skaters
22.7%
fish
54.5%

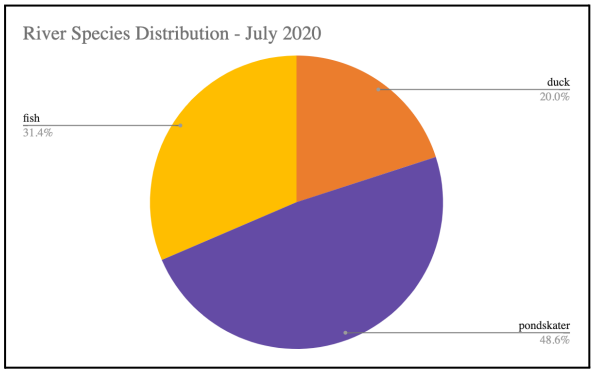

Wetland Species Distribution - April 2020
pied wagtail
5.9%
blackbird
17.6%
duck
23.5%
crow
5.9%
rook
5.9%
moorhen
5.9%
heron
11.8%
seabird
5.9%
wren
17.6%

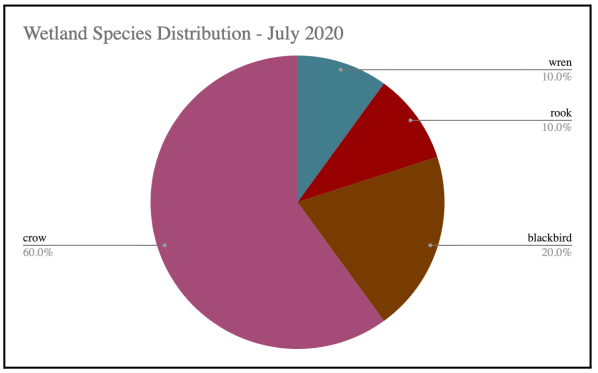

River Species Distribution - May 2020
duck
18.8%
fish
15.6%
crow
15.6%
wagtail
21.9%
rook
9.4%
pond skater
18.8%

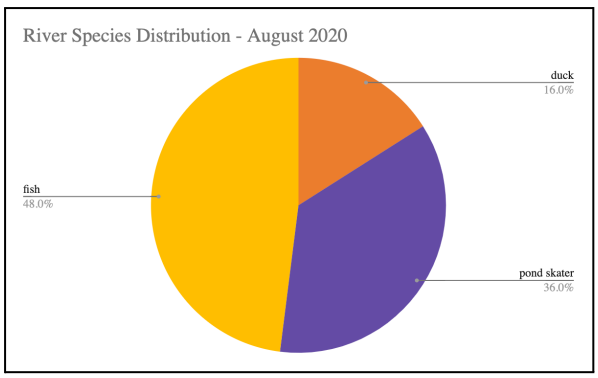

Wetland Species Distribution - May 2020
crow
16.7%
blackbird
50.0%
wagtail
25.0%
wren
8.3%

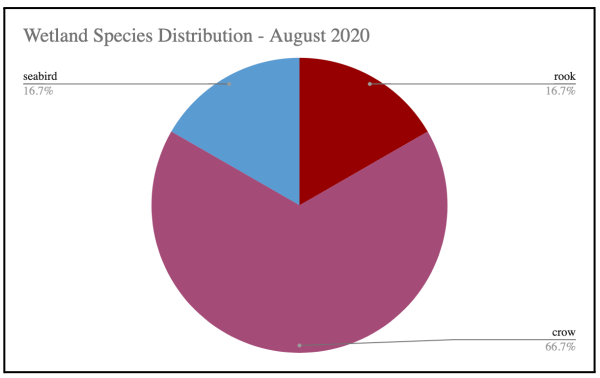


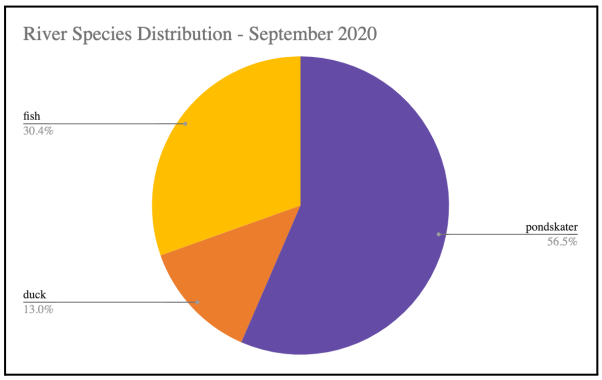


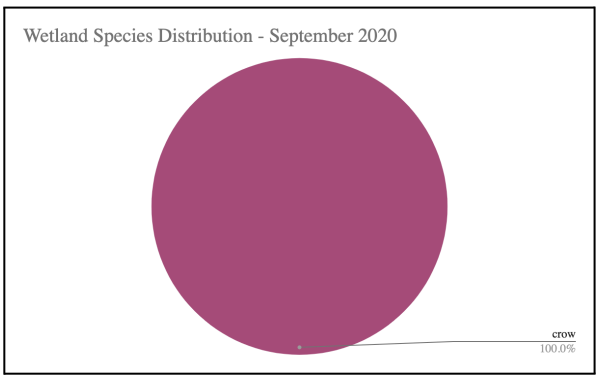












Wildlife was observed flying overhead as well as in the general surrounding area. As mentioned, only sightings directly in the water and directly on the wetland have been considered for these charts. The number of individuals in recorded in appendix b.

Human Activity

The presence of people on or near the river and their activities was documented, and activity level has been graphed to assess engagement with the river.

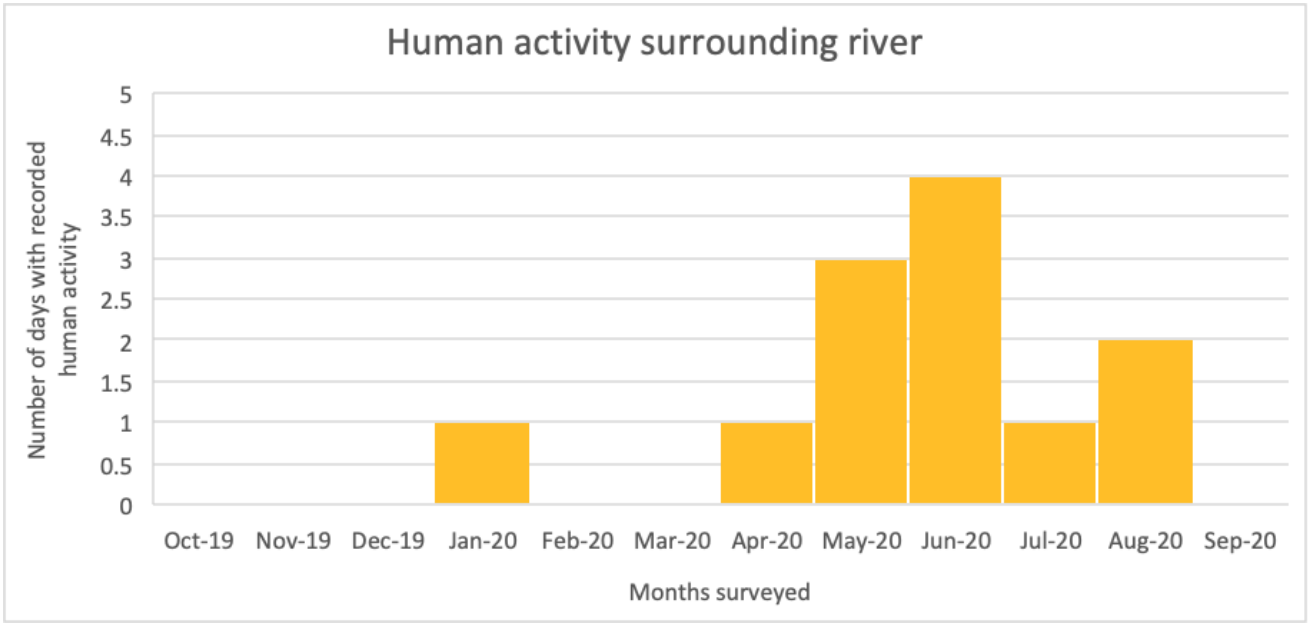


Chart 7: Use of the river by the community was recorded. The number of days per month with observed interaction with the river and wetlands is shown above. The majority of the activity was anglers (Chart 8).

The highest levels of community interaction with the river occurred between April and August, which was also the approximate duration of the second flood season for the Ahare during this study.

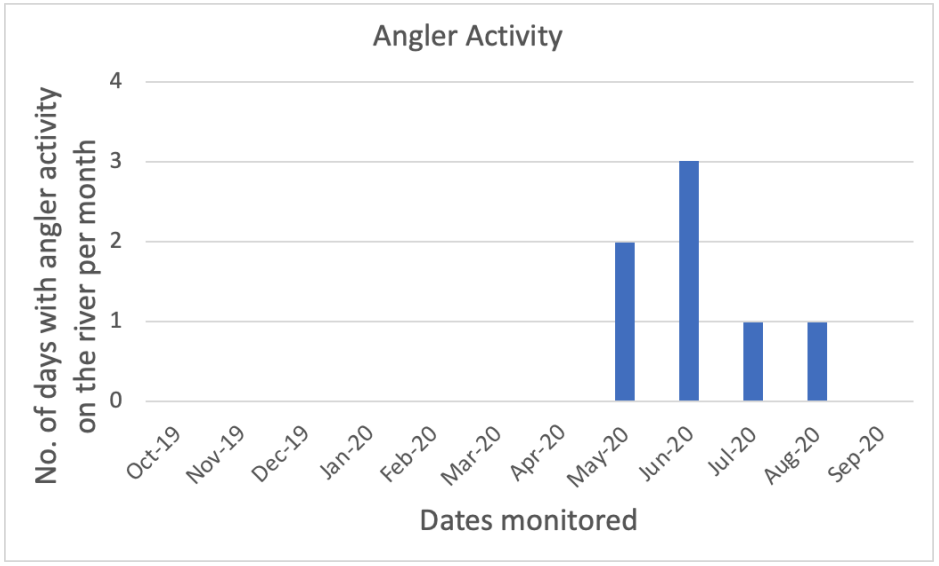


Chart 8: Angler presence on the river was recorded more than any other community interaction. This was confined to the flooding episodes in the summer months.

Discussion

A general trend emerges from the results of this study. Flooding coincides with increased community and biological activity surrounding the river. Flooding creates an increased opportunity for fishing by both local bird populations and anglers. This is a possible explanation for the increase in animal sightings on the river at this time.
As noted above, on approximately ⅓ of days in both April and May the flow observed at the bridge was landward, indicating strong tidal influence when the water level is at its lowest (Chart 3). It should be noted that an unauthorised cut out of the river was carried out in February, with the aim of lowering the water level by facilitating flow to the sea, which may have influenced the water levels at this time of year.
Seasonal fluctuations in water level are expected, and late August peaks as seen in Chart 2 can be attributed to two large storms, Storm Ellen and Storm Frances. Flooding trends of the river largely match regional precipitation levels. The Ahare river shows a consistent water level rise in response to high levels of precipitation, as shown in Chart 1a.

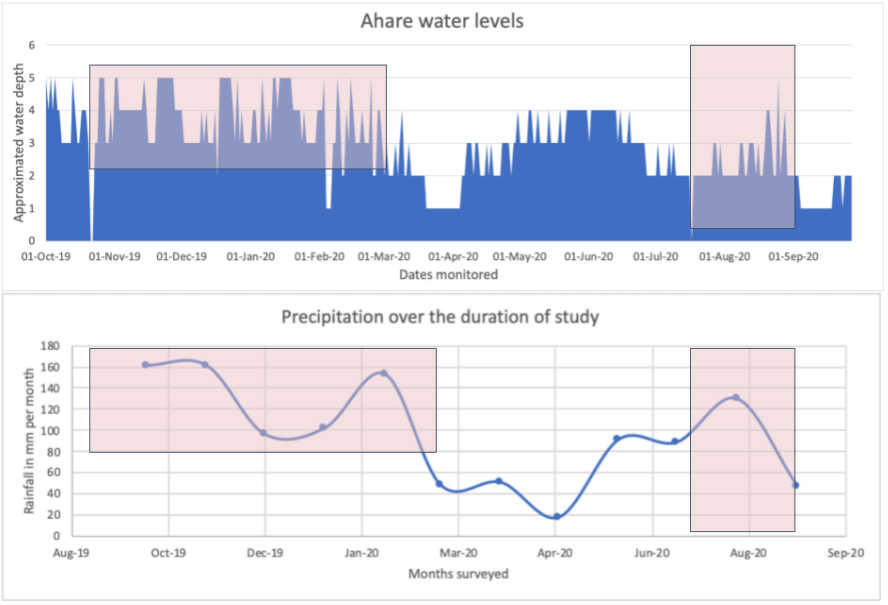


Chart 1a: In chart 1a, the rise in water level associated with increased precipitation is highlighted in red.

Regarding the unauthorised works, there is no evidence in this study that they had the desired effect of lowering annual water levels in the Ahare. In the accompanying photographs of the Ahare rivers estuary, the complete recovery of the rivers original exit to sea, and related estuarine habitats, took approximately 6 months (noted on 29th September 2020) shown in picture 4. By August 2020 (picture 3), flow appears uninhibited at the beach monitoring site, and has returned to a northerly flow direction. While there was an immediate bounce back to pre cut out water levels, the recovery of the rivers exit along the beach took several months. This is the most notable effect of these works over the duration of the study.

Picture 3 (left) was taken in August 2020, facing north and showing free flowing exit to sea, returning to its original route. Picture 4 (right) was taken on 29th September 2020, showing rivers complete return to its natural flow (photos courtesy of Cathy Lee)

Looking at the bigger picture, and as described in results, the Ahare river and surrounding wetland underwent two separate flooding intervals over the course of this study. The first half of Chart 4a shows that the wetland area responds very differently to a rise in water levels in the colder and warmer months.

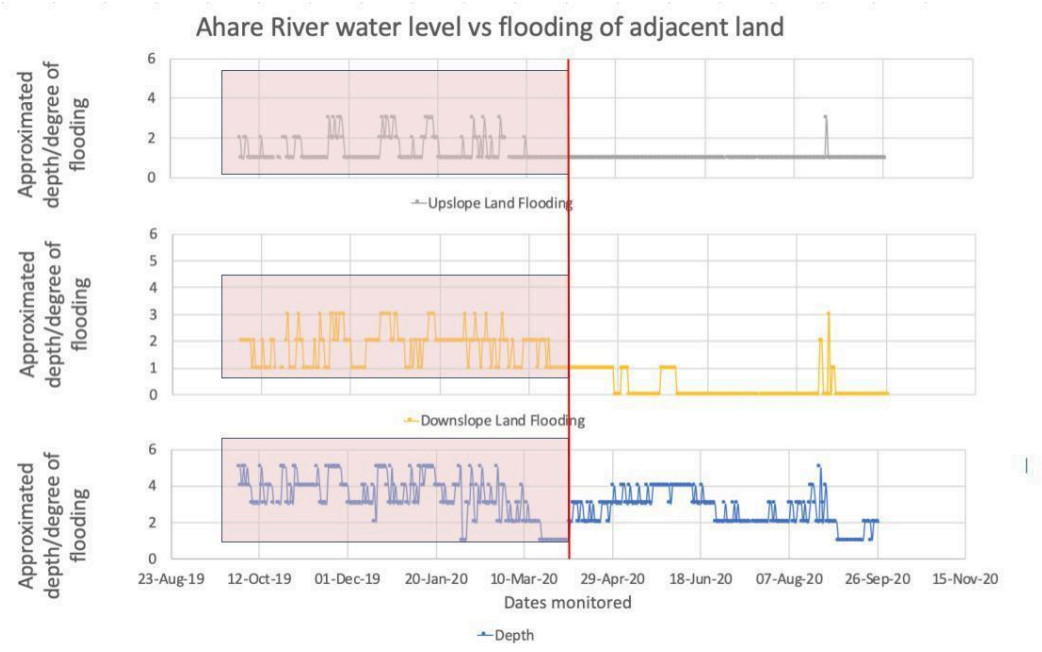


Chart 4a: The simultaneous flooding in the cold months described in chart 4 is highlighted in red boxes, the trends outside of these boxes are asynchronous. The rise in water level in the second half of the study does not result in flooding of the wetland. The red line indicates the transition between these flooding phases.

The flooding in winter months may be due to poor drainage through frozen soil during a period of high precipitation.
This flooding dynamic was also observed in the assessment of the road. November and January had high levels of precipitation, and the highest number of days with impassable roads, along with

February. Rainfall in February was less severe than in November and January, and the road didn't flood again until the end of August despite fluctuating rain levels throughout the year. This suggests that a greater level of care should be taken to minimise flood damage in winter months.

The patterns of wildlife activity on the river were unsurprising. Chart 6a shows the number of days per month that wildlife activity was recorded on the river. The summer months show higher levels of activity. These are also the months with lowest water levels in the surrounding wetland (Chart 4). It is also notable that during the colder winter months, increases in activity directly on the river coincide with spikes in water level (Chart 2).
The seasonal change in species distribution is especially clear in this report. Birds were by far the most abundant and varied biota. Between March-May the array of observed species changes almost entirely on the wetland. The change on the river is less evident although limited by species that can be observed from above water. Human interaction with the river peaks during this transitional phase, Chart 7 showing that the community interaction with the river was highest between April and August. Of these instances, the vast majority were anglers as the open season for trout and salmon anglers is from mid-March to the end of September. This is highlighted in Chart 8.