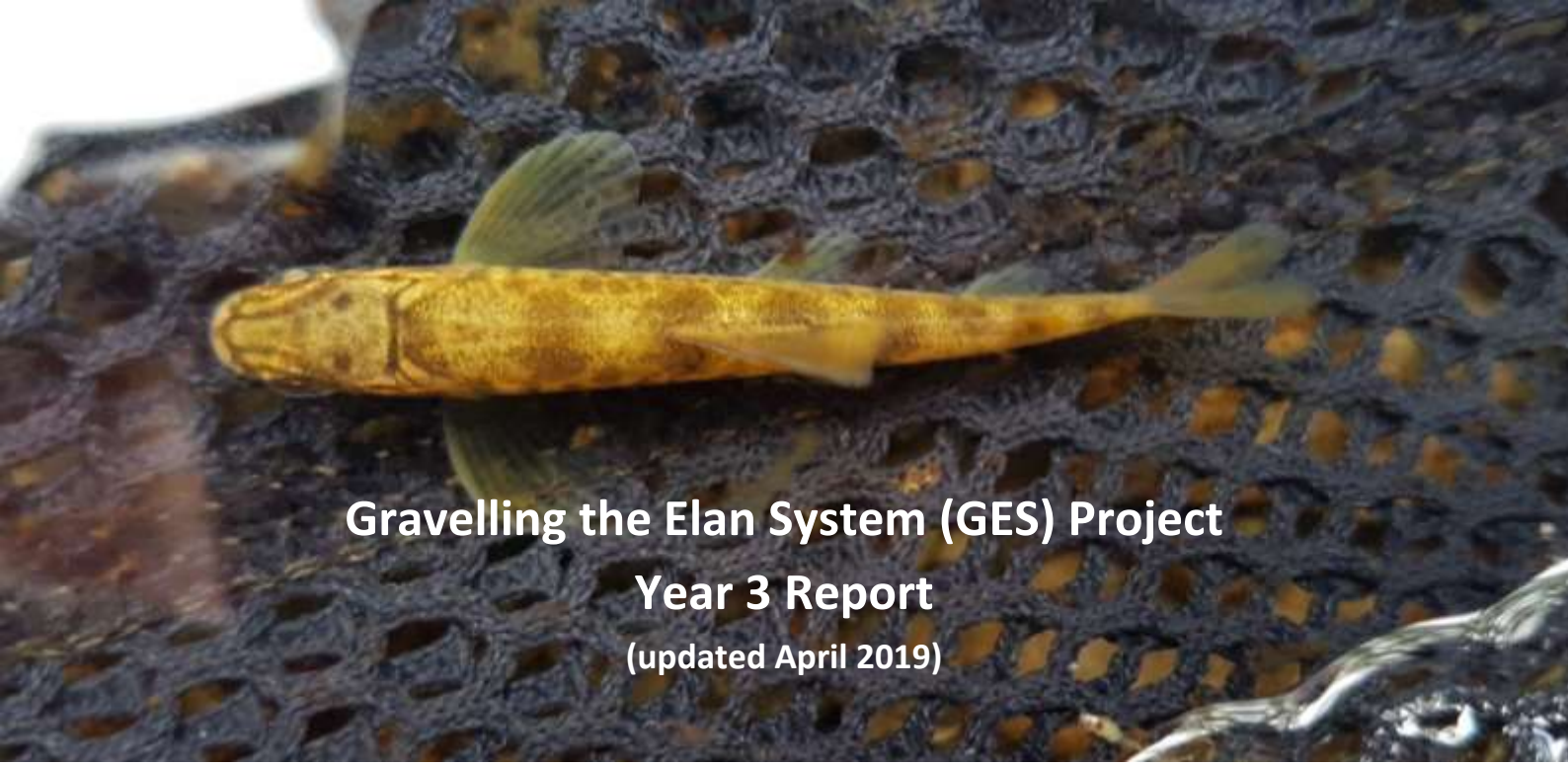


Gravelling the Elan System (GES) Project
Year 3 Report
(updated April 2019)

Contents

Dŵr Cymru Welsh Water

Cyfoeth Naturiol Cymru Natural Resources Wales

ELAN valley

The Wye & Usk Foundation ACTION FOR FISHERIES

1. Introduction and Aims of the Project

The Elan prior to the project, its riverbed characterised by large boulders with no gravel or fine sediments in between

In 1932, JA Hutton noted that salmon no longer spawned right below the Caban Coch dam as they had once and were now only spawning in downstream reaches. Since the construction of the Elan dams in 1904, the gravel in which they create their redds had been washing downstream while the supply of fresh gravel from upstream had ceased. This negative trend has continued since then.

When this project started in 2016 the Elan had no suitable spawning gravels in the 4km of river immediately below the dam. In the lowest 3km of the Elan the gravels were depleted and in many cases, compacted. This situation was impacting negatively on both the invertebrate and fish populations.

The requirements of the Water Framework and Habitats Directives (WFD & HD) are for action to take place to correct this with the date for completion of these actions for Special Area of Conservation (SAC) rivers being 22nd December 2015. In 2016, Natural Resources Wales (NRW) produced a paper (Sediment Report Elan) within which they identified possible interventions to restore the “diversity of flow types and depositional features”, many of which were included in the original bid document for this project.

The objectives of the project are the restoration of the ecological status of the Elan (in so far as this is practical without dam removal) as required by the WFD to reach “Good Ecological Potential.”

2. Project Planning, Delivery & Outputs

2.1 Review of 2016 & 2017

The previous two reports gave details of the slow progress made during the original WUF project (Sir Maesyfed Salar 2012), with regards obtaining necessary consents to carry out gravel reintroduction into the Elan.

The lessons learnt from this meant that the process of consenting the 2016 and 2017 gravel operations with NRW, Powys County Council (PCC) and Dwr Cymru Welsh Water (DCWW) has been smoother.

The 2017 report detailed the problems in locating a suitable source site that year. The 2016 site at Ty Mawr on the upper Wye had not fully recovered (60%) and Elan Valley Trust (EVT) remained adverse to us using gravel sources in the upper Elan.

The eventual source site was a gravel bar just downstream of Rhayader. The gravel was again reintroduced to the Elan just downstream of the Visitor Centre using a slightly different methodology than the previous year. In 2016 we had placed some of the new gravel directly into the river channel and there had been some concerns raised about the amount of sediment washing down the Elan during the five-day operation. Despite fine sediment being a crucial part of restoring the Elan’s natural ecology, its presence in the water column during low flow events can be deleterious.

In 2017 we adapted our methodology and placed all the new gravel on the bank, to be distributed naturally by the winter flows. 340 tonnes were introduced, adding to the 2,000 tonnes of the previous year.

2.2 The Gravel Moving Operation in 2018

Some time was spent in the early part of the year searching once more for suitable donor sites, along with exploring alternatives to taking river gravel.

Digging gravel from the Elan flood plain was one possible alternative. However, the lack of certainty of the quality of the deposits (without undertaking expensive surveys) discounted this option. Also, local landowners who valued highly their limited grazing area were unlikely to want large holes dug. We found one potential site where the landowner was willing to consider the creation of a new pond but the logistics of transporting the gravel from the site ruled it out. Also, his involvement in a Glastir scheme would have entailed a significant amount of paperwork.

Sourcing gravel from quarries had been discounted previously. Although this method had been used successfully by other UK rivers trusts to create fish spawning beds, quarry gravel is usually uniform in size (or comes in a few sizes only) and has not been subject to fluvial processes. This project's objective is to restore the natural ecology of the lower Elan (not just fish spawning), requiring a natural variation in stone size, right down to fine sediment. The nearest quarry that extracted flood plain gravel is Wellington, Herefordshire; some 45 miles away and of a different geology to the Elan.

The Dolymynach site also remained a potential donor site (and had Elan Valley Trust's approval). Although concerns remained over the practicalities of taking gravel from there, the extremely low water levels in the summer had gone some way to alleviate these. However, there were questions over any contamination of water and sediments at this site from old mine workings in the Claerwen catchment.

Water and sediment samples were taken from several locations from the Claerwen and upper Elan areas on 2nd and 3rd August by Ingrid Jüttner from Department of Natural Sciences, National Museum Wales. The results were sent to us on 2nd October, a day before the gravel operation was due to start and showed a slight elevation in levels of lead at Dolymynach. While there was a possibility of this result, the decision had been made a few weeks earlier not to progress work at this site, even though it had been consented.

Other potential sites were explored in the upper Wye. Meanwhile, discussions with the Elan Valley Trust had continued regarding the potential donor site on the upper Elan. The trustees had stated previously that their support for the project would depend on it showing positive results. The monitoring results of 2017 & '18 (detailed below) and reassurances given in a report from Oliver Lowe, NRW's River Morphology Technical Advisor (attached separately to this report) enabled the trustees to give us permission to use the site, subject to conditions.

With all consents in place and having carried out a European Protected Species (EPS) survey, on Wednesday 3rd October we started 2018's operation. Over 2½ days and using 26-tonne quarry lorries instead of tractors and trailers, we moved just over 1,000 tonnes from the upper Elan to the reintroduction site. This was much less than we had originally hoped (we had consent for 4,000 tonnes), due mainly to the following reasons:

1. Less gravel remained at the site following a Powys Highways attempt to prevent erosion of the nearby road earlier in the year.
2. More of the gravel shoal had become vegetated in 2018, reducing the area we could extract.
3. While the upper layers were a good mixture of stone size, below this was mostly fine sediments.

One of the conditions of Elan Valley Trust (also a recommendation in NRW's proposal) was that we supplied the local tenant farmers with some of the extracted gravel. Using river gravel for tracks had been taking place ad hoc previously. By bringing it into the project some control and best practice could be applied. A lorry-load (approx. 25 tonnes) was supplied to each of the three tenants.

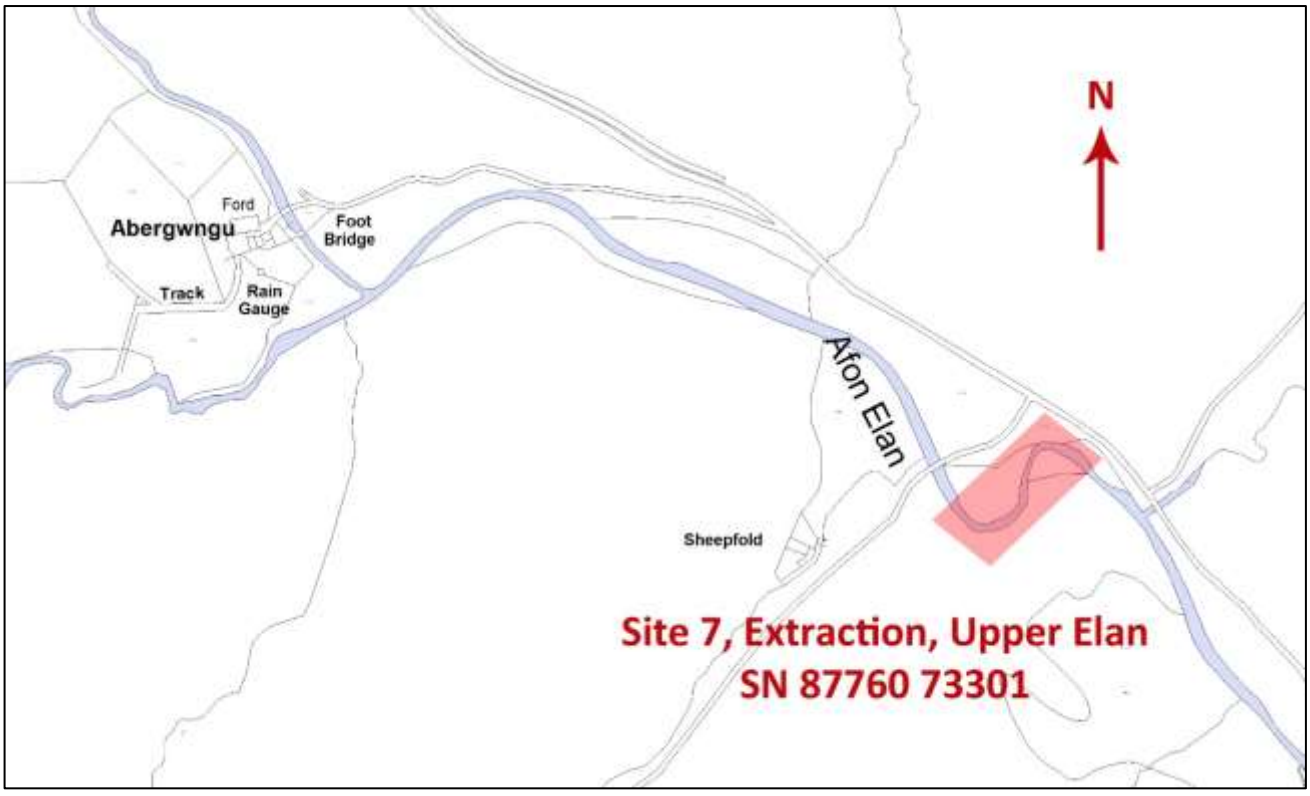
Another NRW recommendation was that some of the gravel was used to build up the erosion defence of the road. However, Highways representative Adam Parry visited the site during day one of the operation and told Louis Macdonald-Ames, our Head of Operations, that he did not want us to do this.

NRW representatives Oliver Lowe, Jason Jones and Jonathan Gilpin visited the extraction and introductions sites on day two (Thursday 4th Oct) and were satisfied that the operation was being carried out according to the plan and consent conditions.

We photographed the entire site before, during and following completion of the operation on Friday 5th. Unfortunately, our drone was inoperative so we haven't yet been able to take any overhead photos post-operation yet. We returned to the site 10 days after completion following the first spate event and, as with previous years' donor sites, there was evidence of recovery. Further checks of the donor site in early 2019 showed that this recovery had slowed and that the site was unlikely to be appropriate to be used again later in the year.

Oliver Lowe will, of course, be able to provide a more expert assessment on this but we will be returning to the site regularly over the year to check and record the gravel movements.

2.3 Extraction Site – Upper Elan (map & photos)



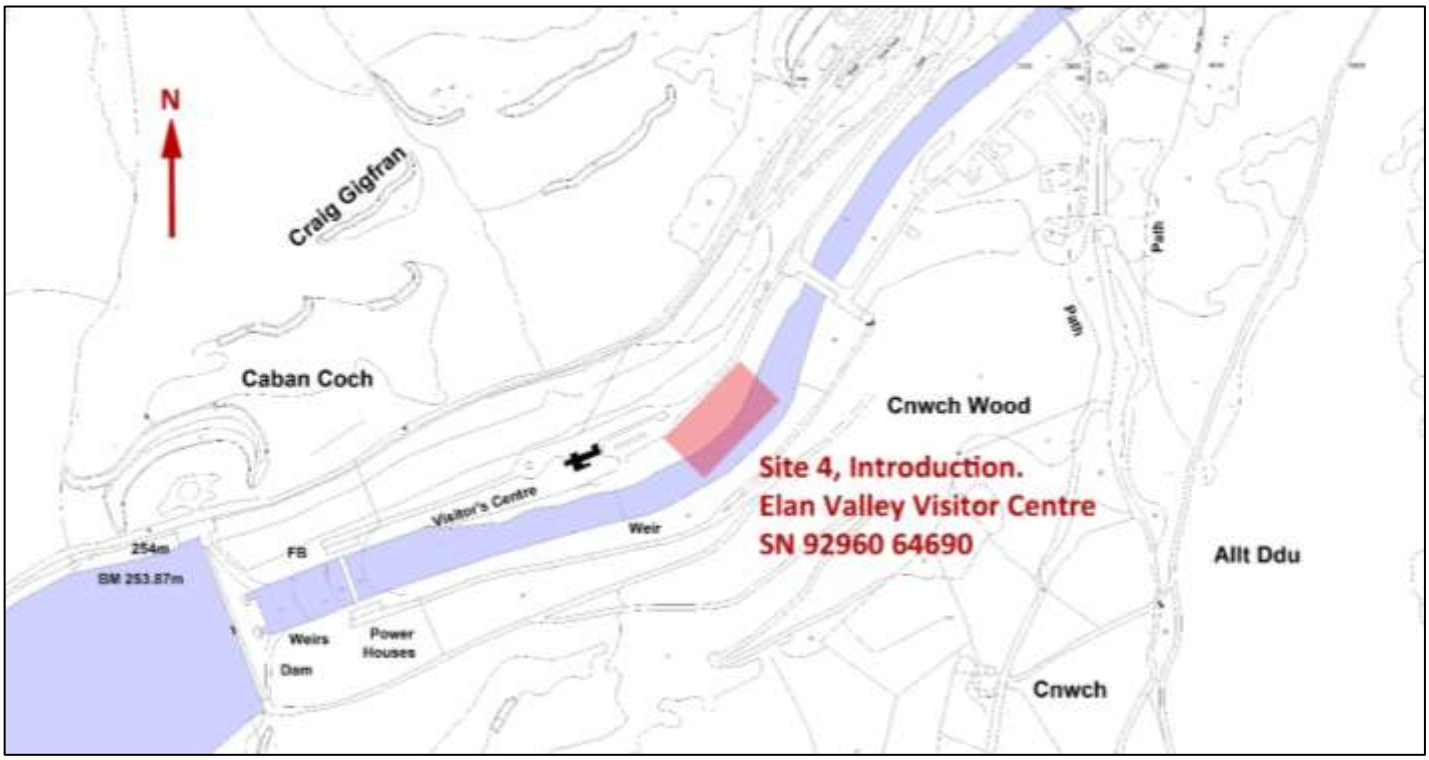
Overhead drone photo of site pre-extraction

Extraction taking place October 2018. WUF staff using plant to scrape back dry gravel ready to be loaded onto lorries

2.4 Introduction Site, Elan Valley Visitor Centre

The same introduction site was used in 2018 as had been in the two previous years. As with 2017, we placed the gravel on the bank for it to be distributed by the high winter flows.

In 2018 we also carried out some gravel loosening work in an area of the lower Elan where the riverbed had become compacted.

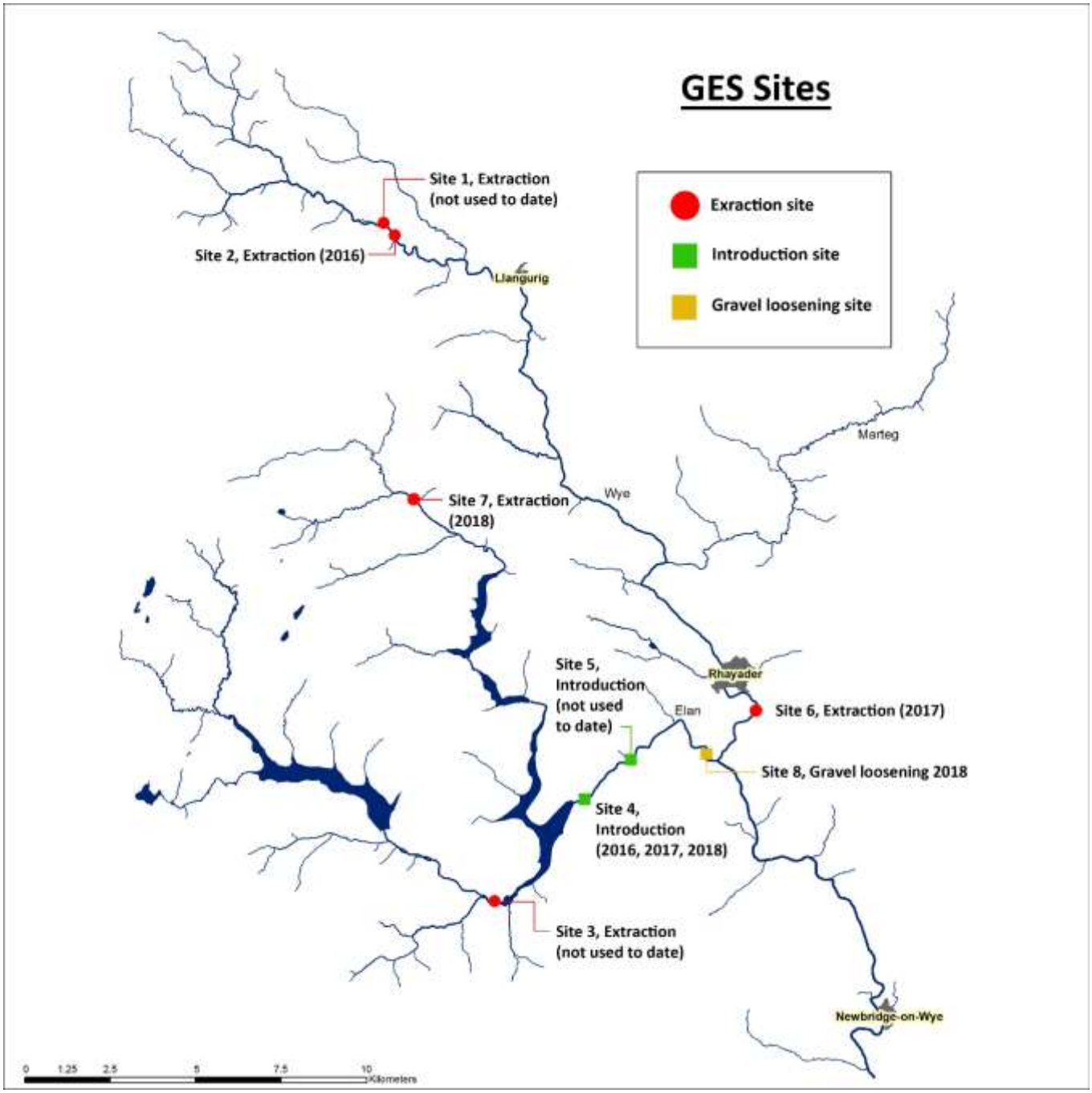


Tipping the extracted gravel at the introduction site ready to be spread along the bank

New gravel placed on the riverbank ready for natural distribution by higher winter flows

Loosening compacted gravel further downstream

2.5 GES Extraction & Introduction Sites Over The Whole Project (2016 - 2018)



2.6 Project Timeline & outputs

YEAR 1			
Original Date	**Original Target**	**Date Completed**	**Outcome**
April/May 2016	Project Start	May 2016	Project Start.
April/May 2016	Arrange contractors/farmers and agree method statement with stakeholders	May to September 2016	Extensive site investigations and consultation with stakeholders, including negotiations with land/riparian owners, hydrology/geomorphology reports, S28 consents, FDC consents.
May/June 2016	Move 2,500 tonnes of gravel from top end of Caban Coch to 2 sites below dam and spread, Gravel de-compaction downstream	Late September 2016	2,000 tonnes of gravel moved from upper Wye to 1 site below dam and spread. No gravel de-compaction downstream.
June 2016	Removal of obstruction advised by NRW	July 2017	NRW change opinion and weir to be retained.
August 2016	Baseline surveys	Early Sept 2016	Electrofishing & gravel deposition survey completed.
Nov/ Dec 2016	Redd count of Elan	Dec 2016	Redd count completed 6 redds found in lower reaches from Glan Elan to junction with Wye.
Spring 2017	2nd gravel deposition survey	March 2017	2nd gravel deposition survey completed.
March 2017	1st year of project ends	March 2017	1st year of project ends.

YEAR 2			
Original Date	**Original Target**	**Date Completed**	**Outcome**
April/May 2017	Source gravel sites, negotiate with owners, agree method statements, obtain consents	April to Sept	1 suitable source site found, same number of consents as 2016 obtained.
July 2017	First invertebrate surveys	July 2017	Invertebrate survey completed.
Aug 2017	Elan electrofishing survey	Aug 2017	Electrofishing survey completed.
Sept 2017	Move 4,000 tonnes from upper Wye source sites to Elan	Oct 2017	340 tonnes moved and stacked along the bank to be distributed downstream in winter flows.
Oct 2017	Project update report	Nov 2017	Project update complete.
Dec 2017	Redd count of Elan	Nov/Dec 2017	Incomplete due to sustained high water, but salmon redds found at Glan Elan, Dolfallen and for the first time in 60+ years, 300m below the visitor centre.
Jan 2018	Interpretation board installed at Visitor Centre intro site		Text and photos supplied to Dwr Cymru September 2018
March 2018	3rd gravel deposition & 2nd invertebrate surveys	March 2018	Invertebrate and gravel deposition surveys complete.

April 2018	2nd year of projects ends – project report	November 2018	Report defrayed until November to include 2018 survey work and gravel moving op.
YEAR 3			
Original Date	**Original Target**	**Date Completed**	**Outcome**
April/May 2018	Consenting gravel source and introduction sites, along with negotiations with land/river owners.	May 2018	Consent gained to use upper Elan donor site late September 2018. No other sites found or secured.
July to September 2018	Introduce 7,600 tonnes of gravel to Elan	October 2018	Just over 1,000 tonnes introduced
August 2018	2nd electrofishing survey & 3rd invertebrate survey	August 2018	Electrofishing survey carried out August
Nov/Dec 2018	3rd Elan redd count	November 2018	Redds found just d/s of Elan Village and at Glan Elan
March 2019	4th gravel deposition survey & 4th invertebrate survey		Invertebrate and gravel deposition surveys complete.
March 2019	3rd year of project ends – final report submitted in April		Interim end of year 3 report submitted December 2018, final report completed April 2019

3. Monitoring Results in 2018/19

3.1 Geomorphological Surveys

The baseline data surveys were carried out in September 2016. The depth between the top of fixed features (e.g large boulders) and the riverbed was measured at 40 sites on the Elan.

Repeat surveys in March 2017 and May 2018 revealed conflicting results, with an average increase in gravel depth of 6.3cm recorded in 2017 and an average decrease in gravel depth of 0.6cm in 2018. This was perhaps to be expected due to the difference in the amount of gravel introduced in 2016 (2,000 tonnes) and 2017 (340 tonnes). In 2018 we introduced 1,050 tonnes of gravel into the Elan at the release site.

The geomorphological surveys of 2019 were carried out on 1st April. It was noted that a substantial amount of the introduced gravel was still present at the release site, probably due to reduced flow rates of winter 2018/19 in comparison to previous years. This may have impacted the results of the 2019 surveys, which revealed an average decrease in gravel depth of 0.3cm (range -20cm to 21cm) between 2018 and 2019 (16 of the 40 test sites displayed a decrease in gravel depth).

It is probable that high water events in 2019 will further disperse the introduced gravel and boost gravel depths in the study area. The results still indicate an average overall increase in gravel depth

of 5.4cm (range -10cm to 36cm) between the baseline data collected in 2016 and the results of the 2019 surveys. Further, only 3 of the 40 test sites have displayed a decrease in gravel depth between 2016 and 2019.

Maps showing the geomorphological survey results can be found on pages 21 – 24.

Wye & Usk Foundation staff undertaking gravel surveys in the Elan in May 2018

3.2 Salmon Spawning Surveys

Due to the exceptionally dry summer, the Elan reservoirs did not over-top until the 4th December. This means that this year's introduced gravel remained on the bank longer than expected and most of the spawning activity has taken place in previous years' gravels, possibly limiting opportunities.

The 2018 spawning survey took place on 27th November. Three confirmed salmon redds were found just downstream of the Elan Village in gravel that had been introduced in 2017. Another redd was recorded in the newly loosened gravel further downstream.

In total, 11 potential salmon redds were found in the Elan during the survey, with two weeks of the typical spawning period remaining.

3.3 Invertebrate Monitoring

On 16th May we carried out the 2018 invertebrate sampling. Surveys recorded the number, quality and diversity (measured using the Biological Monitoring Working Party [BMWP] index) at seven sites from the introduction area downstream to just above the confluence. While the 2017's surveys showed a close correlation between the % of the riverbed covered by gravel and both the number and BWMP of invertebrates, in 2018 we were able to compare survey results on the previous year.

The small amount of gravel introduced in the autumn of 2017 led us to believe that there would not be an improvement in invertebrate populations at our monitoring sites in 2018. This was indeed the case with only one site out of seven (Site 5) improving on 2017 while there was a decrease in BWMP at two sites. With 1,000 tonnes introduced in the autumn of 2018 we were hopeful the situation would improve for invertebrates in 2019.

The 2019 invertebrate sampling was carried out on 1st April. Kick sampling surveys were used to record the number and diversity of invertebrates at seven sites ranging from the gravel introduction area to the Elan's lowest reaches, just before its confluence with the Wye. The Biological Monitoring Working Party (BMWP) scoring system was used to ascertain the water quality of the survey sites.

The results of the invertebrate sampling suggest that BMWP scores improved at 6 of the 7 sample sites between 2018 and 2019. The BMWP scores of 2 of the furthest upstream sites (sites 1 and 3) have more than doubled. Further, the improvement of the BMWP scores for sites 1 to 3 raise the BMWP category of all 3 sites from "poor" to "moderate" quality. Due to this improvement, 6 of the 7 sites now score either "moderate" or "good" quality status.

This increase in BMWP score was predicted due to the increased amount of gravel released in 2018 compared to 2017. The only site that displayed a decreased BMWP score between 2018 and 2019 was site 5. This is perhaps unexpected, as site 5 was the only site to display an increased BMWP score between the years of 2017 and 2018.

Between 2018 and 2019 the number of different macroinvertebrate families increased at every site, with the exception of site 5 where it remained the same. In addition, the abundance of invertebrates increased significantly at 3 sites. The largest increase was recorded at site 6, Dolfallen Bridge, where the abundance increased from 41 individuals to 126 in 2019. Conversely, the abundance has decreased at 4 of the 7 sampling sites, sites 2 to 5. The most dramatic decrease was recorded at site 3, which dropped from 44 individuals to 8 in 2019.

In addition to a bullhead (Cottus gobio) and a stone loach (Barbatula barbatula), two small salmonid fry were observed on the Elan during sampling. This reaffirms the findings of the spawning survey in December 2018 and suggests that there might be more positive results from the electrofishing surveys planned later in 2019.

Maps showing the macroinvertebrate survey results at the sample sites can be found on pages 29 – 31.

Summary table:

	May 2018			March 2019		
Sampling Site	**BMWP**	**Abundance**	**Family Taxon Number**	**BMWP**	**Abundance**	**Family Taxon Number**
1	20	4	2	44	13	7
2	24	32	4	44	18	7
3	20	44	3	45	8	5
4	51	54	5	54	31	9
5	49	32	6	39	11	6
6	49	41	6	88	126	14
7	43	37	6	53	87	7

Improved Results

Foundation staff carrying out the invertebrate survey on 1st April 2019

3.4 Electrofishing Surveys

The 2018 Elan electrofishing surveys were carried out on 8th & 9th August. The same 8 sites as previous years were surveyed using 5 minute minimum estimate methodology (ME), from the introduction site to the Wye confluence. It should be noted that in 2016, the 4 furthest downstream sites were surveyed for the baseline data in 2016 using a semi-quantitative method, giving a slightly higher catch than if using ME. Since then, all sites have been surveyed using ME.

In addition, we decided to fish an extra six sites in 2018 in the 2km or so immediately downstream of the introduction site.

The rationale was that at the three existing sites in that area not much of the new gravel had accumulated (this was a very difficult thing to judge before the project started). They were therefore very unlikely to provide suitable salmonid spawning and juvenile habitat. The six extra sites fished were where we thought juveniles were likely to be and close to where we had witnessed potential spawning activity the previous winter.

The results showed that for the first time since at least the 1970s when electrofishing surveys began, salmon and trout fry were found in that section of the Elan (highlighted in red in the 2018 table below). This means that both species had used the new gravel in which to spawn in the winter of 2017/18 (this part of the river was almost completely devoid of gravel before the first introduction in 2016). A photo of one of the salmon fry is shown in the title of this report.

The results also showed large increases in the densities of salmon juveniles and 1+ trout in the sites further down the Elan, probably due to the extra flows last autumn that encouraged more fish to migrate further upriver.

The tables on the following page give the electrofishing results. These are also shown on the maps given at the end of this report (pages 25 to 28).

The results from the 2018 electrofishing survey at Dolfallen Bridge, where 38 salmon fry, 8 salmon parr, 8 trout fry and 6 trout parr were recorded. One of the salmon fry recorded at Elan Village is shown on the front page of this report.

GES Electrofishing Results 2016, 2017 & 2018

2016	Salmon Fry	Salmon Parr	Trout Fry	Trout Adults
Gravel Introduction Site	0	0	0	0
U/S Weir	0	0	0	1
Cae Melyn	0	0	0	0
Dolafallen Bridge	0	0	0	0
Upstream Glan Elan	0	0	0	4
Glan Elan Bend	6	0	1	0
400m Upstream Glyn Bridge	0	0	2	3
Upstream Wye Junction	3	0	6	4

2017	Salmon Fry	Salmon Parr	Trout Fry	Trout Adults
Gravel Introduction Site	0	0	0	3
U/S Weir	0	0	0	6
Cae Melyn	0	0	0	5
Dolafallen Bridge	0	0	0	4
Upstream Glan Elan	0	0	0	4
Glan Elan Bend	0	0	2	3
400m Upstream Glyn Bridge	8	3	3	3
Upstream Wye Junction	11	2	5	6

2018	Salmon Fry	Salmon Parr	Trout Fry	Trout Adults
Gravel Introduction Site	0	0	0	3
Opposite EVT	0	0	3	2
U/S Weir	0	0	0	6
100m Downstream of Weir	0	0	8	3
150m Upstream Footbridge	0	0	1	0
Elan Village Foot bridge	6	0	4	3
Upstream STW	0	0	2	4
Opposite Elan Oaks Campsite	0	0	0	3
Cae Melyn	0	0	0	9
Dolafallen Bridge	38	8	8	6
Upstream Glan Elan	10	2	6	8
Glan Elan Bend	8	0	10	14
400m Upstream Glyn Bridge	0	2	9	12
Upstream Wye Junction	40	11	10	18

New survey sites in 2018 marked by the darker text

4. Project Finance, 2015/16 to 2018/19

	Year 1	Year 2	Year 3
Income			
Dwr Cymru	19,773	20,000	20,000
NRW (Alternative Mitigation Funds)	18,895	4,262	16,546
Total	**£38,668**	**£24,262**	**£36,546**
Expenditure			
Direction	3,324	3,876	4,472
Project Management	3,778	5,718	10,366
Head of Land Management	37	5	6
Head of Ops	4,200	2,450	3,923
Habitat Staff	1,977	585	1,912
Finance & Admin staff	1,425	3,979	1,951
Monitoring	451	1,815	871
Materials	3,747	486	232
Equipment hire	15,697	1,264	8,120
Contractors	0	0	1,726
Other costs	0	1,310	0
Travel	1,345	377	856
Overheads	2,686	2,397	2,111
Total	**£38,668**	**£24,262**	**£36,546**

n.b. expenditure matched income exactly because any expenditure over and above the funding provided by Dwr Cymru was covered by Alternative Mitigation funds.

5. Summary and Looking Forward

In the 2017 report we looked forward to the 2018 electrofishing results with some anticipation, having found what we thought were salmon redds in the new gravel last winter.

Confirmation of the presence of both salmon and trout fry in these areas in August has been the major result for this project, following on from the improvements in the river's invertebrate populations in the previous two years.

The project has gained excellent publicity as a result, with coverage in local and national media (BBC & ITV news websites, Countryfile Magazine etc). This has shown that the project has a great deal of potential interest not just to anglers and those living in and around the Elan Valley.

Another highlight of 2018 was the Elan Valley Trust joining as a project partner. It is very much hoped that a closer future working relationship with the Trust will be beneficial to all parties. The gravel donor sites at the top of the Elan could be the answer to the problems in finding suitable sites elsewhere in the Wye catchment that have limited the amount of gravel re-introduced to the Elan. This year's operation progressing without issue could mean that there is a nearby site to return to each year that is reliable, cost effective and is the lower Elan's natural source of gravel.

December 2018's positive redd counting surveys, further improvements in the Elan's invertebrate populations in the spring of 2019 and the sighting of salmonid fry during those surveys, means we are again looking forward to the electrofishing results this summer with some anticipation. We hope that further evidence of the success of this project will be recorded.

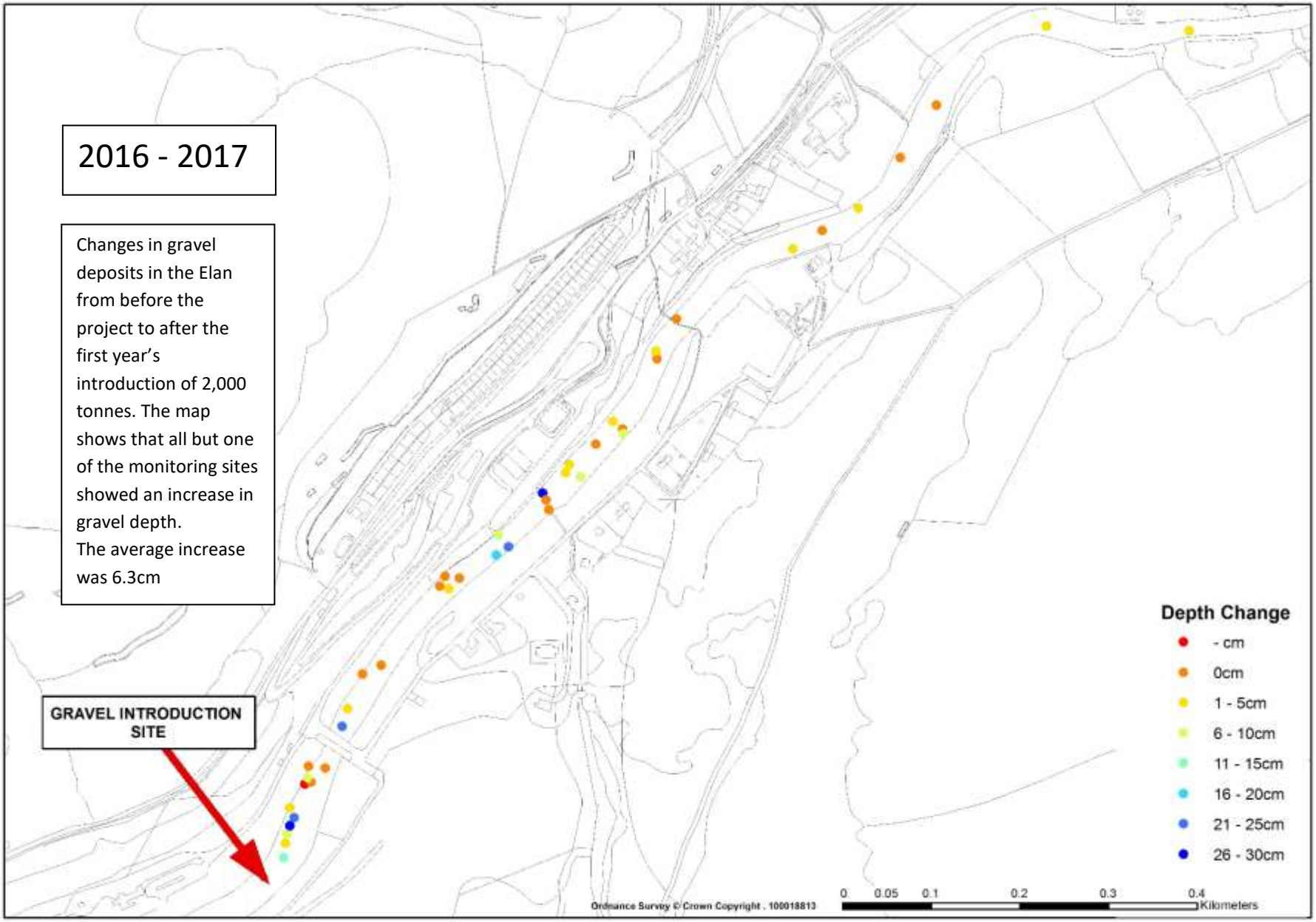
The support of our project partners (Dwr Cymru, NRW and Elan Valley Trust) in the GES project has been essential since its conception. 2018/19 was the last year that Dwr Cymru have committed funds for the project but NRW are keen on extending it and we hope EVT are too, especially now that the benefits to the river's ecology have been demonstrated clearly. GES is still the means by which the lower Elan can achieve Good Ecological Potential so it is very much hoped that everyone agrees that this is an enterprise worth continued support.

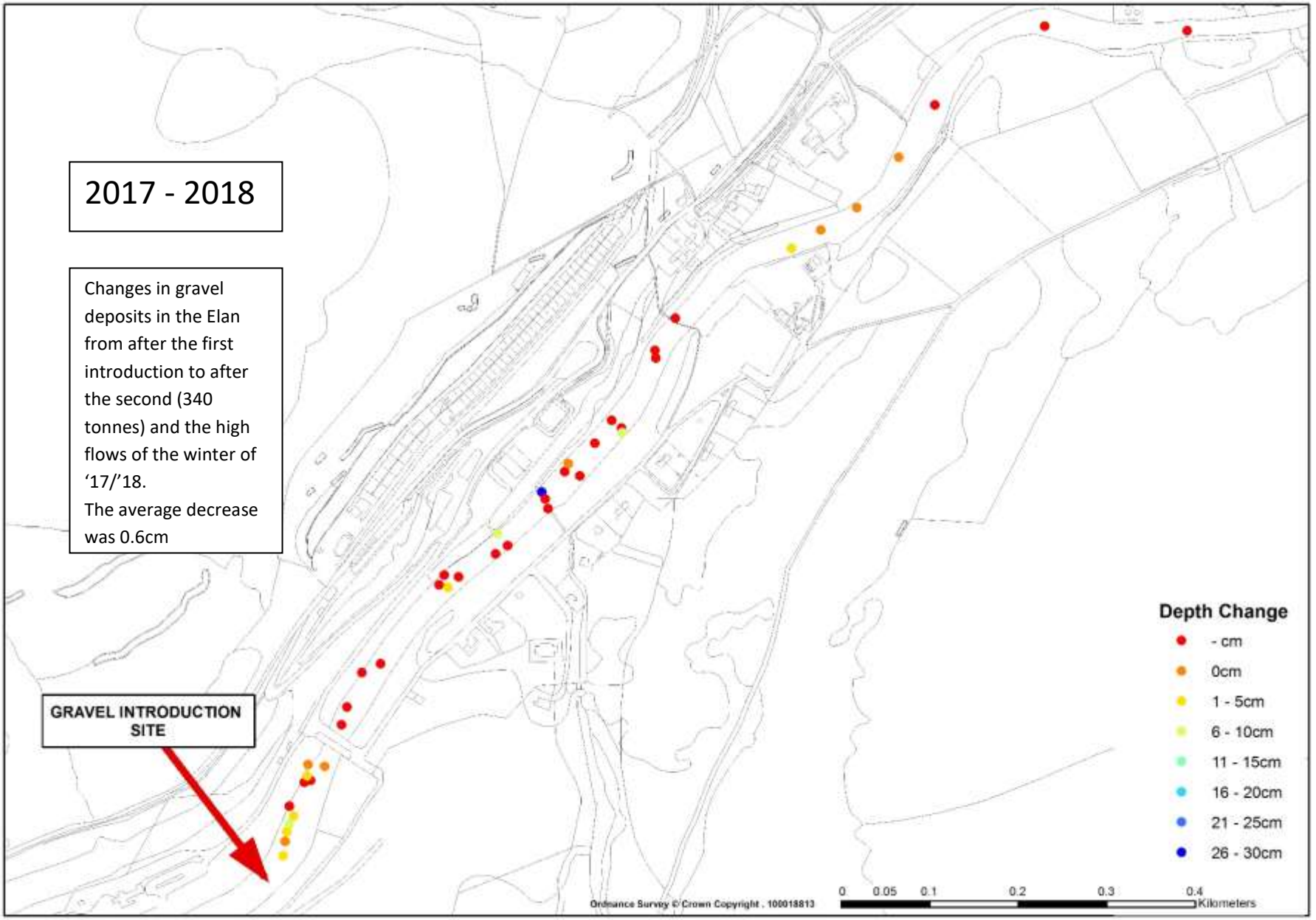
A large part of the costs of previous years' gravel operations have been taken up with sourcing donor sites, meetings, negotiations and project management. Now that the benefits of the project have been demonstrated and a reliable source of gravel consented and used, it is hoped that the operation in future years can be carried out with minimal costs. We have calculated that a further 1,500 to 2,000 tonnes of gravel needs to be introduced in 2019, with yearly top-ups of 500 tonnes thereafter.

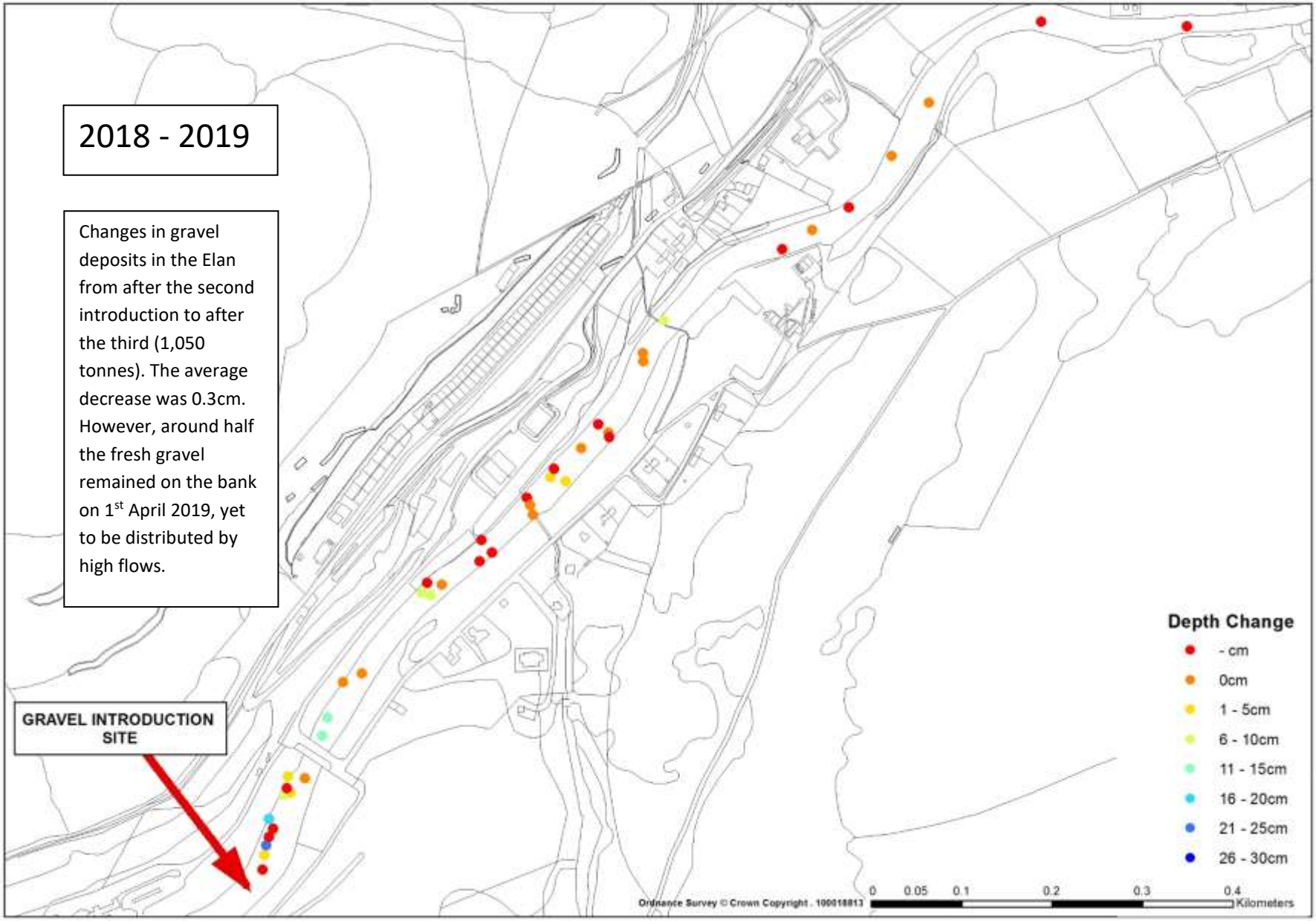
In the End of Year 2 report, the Elan's importance as salmonid spawning and juvenile habitat was stressed, both now and especially in the future as climate change occurs. 2018's drought conditions, along with the extreme water temperatures experienced in rivers across the country only go to reinforce this.

Wye & Usk Foundation
April 2019

Gravel Movement Maps




2017 - 2018
Changes in gravel deposits in the Elan from after the first introduction to after the second (340 tonnes) and the high flows of the winter of '17/'18.
The average decrease was 0.6cm
GRAVEL INTRODUCTION SITE
Depth Change
- cm
0cm
1 - 5cm
6 - 10cm
11 - 15cm
16 - 20cm
21 - 25cm
26 - 30cm
0 0.05 0.1 0.2 0.3 0.4
Kilometers
Ordnance Survey © Crown Copyright . 100018813


2018 - 2019
Changes in gravel deposits in the Elan from after the second introduction to after the third (1,050 tonnes). The average decrease was 0.3cm. However, around half the fresh gravel remained on the bank on 1st April 2019, yet to be distributed by high flows.
GRAVEL INTRODUCTION SITE
Depth Change
- cm
0cm
1 - 5cm
6 - 10cm
11 - 15cm
16 - 20cm
21 - 25cm
26 - 30cm
0 0.05 0.1 0.2 0.3 0.4
Kilometers
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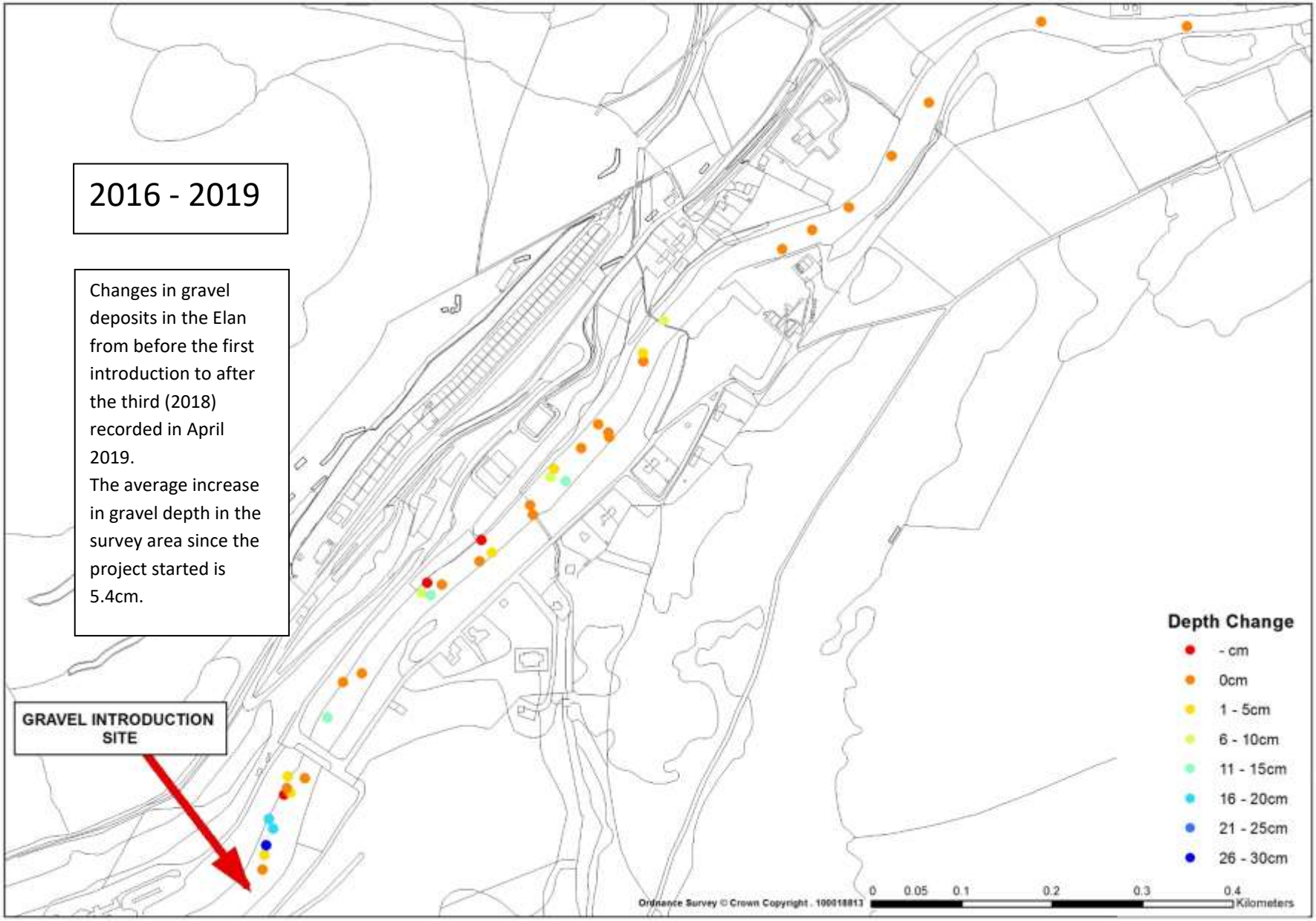
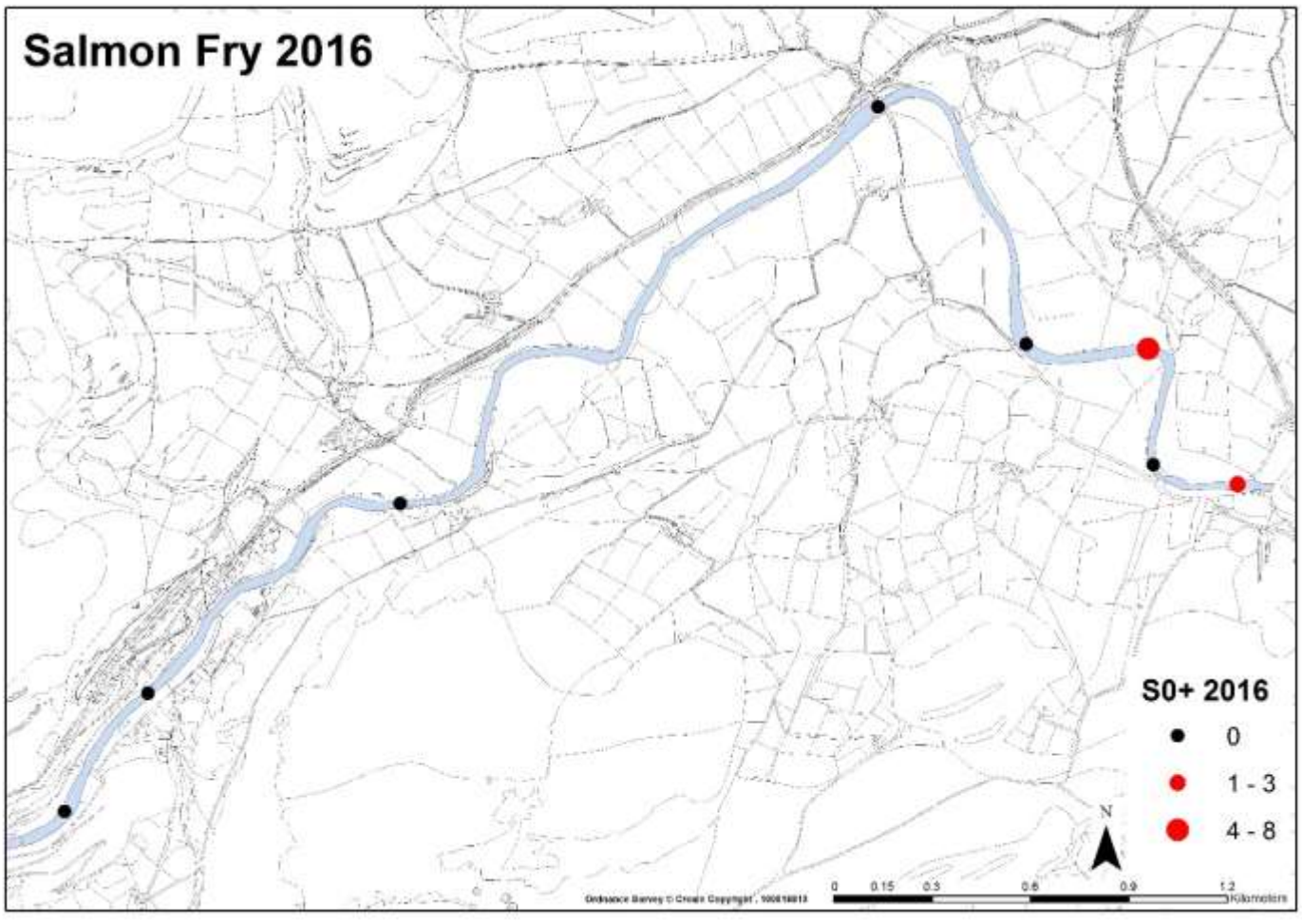
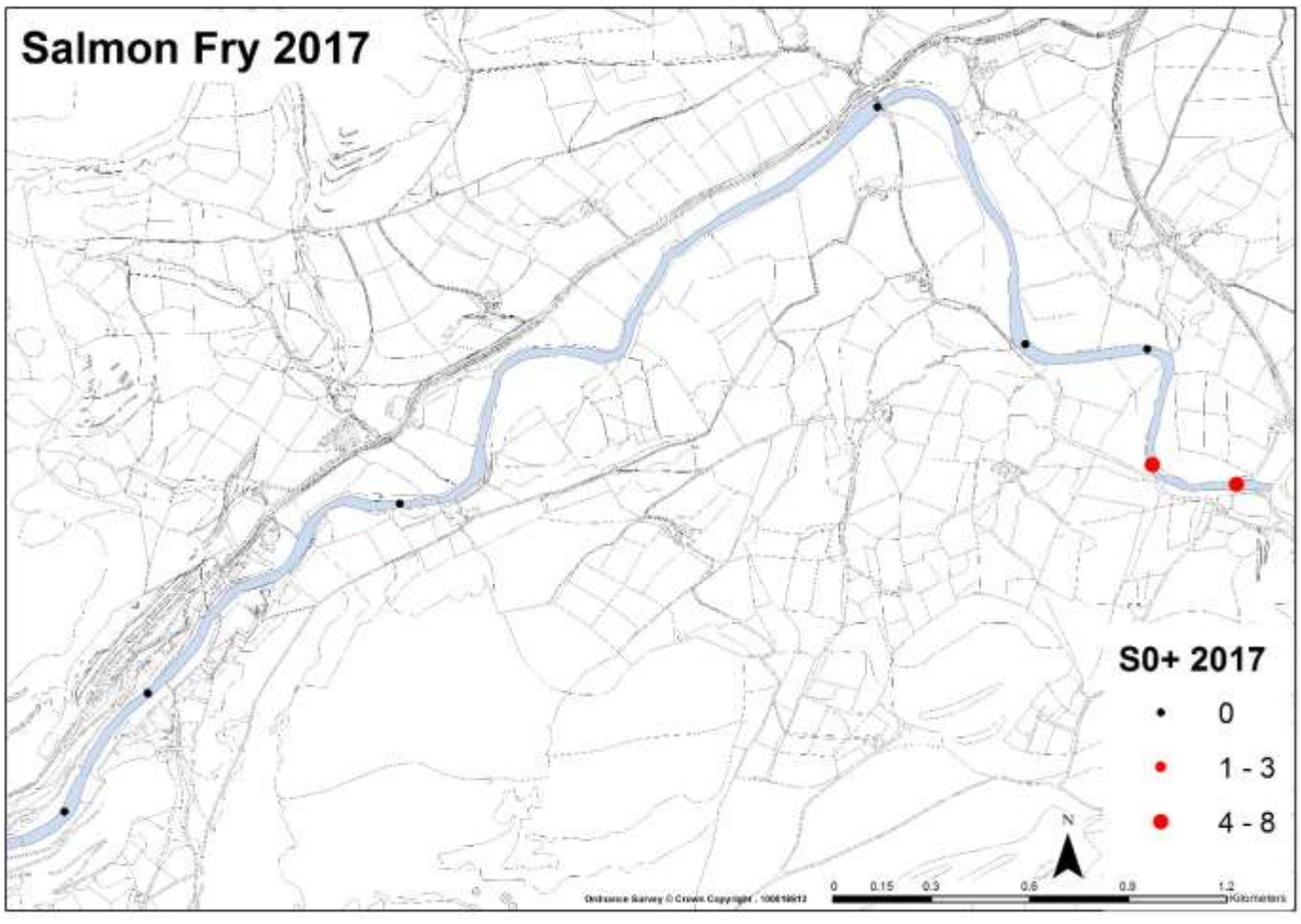

2016 - 2019
Changes in gravel deposits in the Elan from before the first introduction to after the third (2018) recorded in April 2019.
The average increase in gravel depth in the survey area since the project started is 5.4cm.
GRAVEL INTRODUCTION SITE
Depth Change
- cm
0cm
1 - 5cm
6 - 10cm
11 - 15cm
16 - 20cm
21 - 25cm
26 - 30cm
0 0.05 0.1 0.2 0.3 0.4
Kilometers
Ordnance Survey © Crown Copyright . 100018813

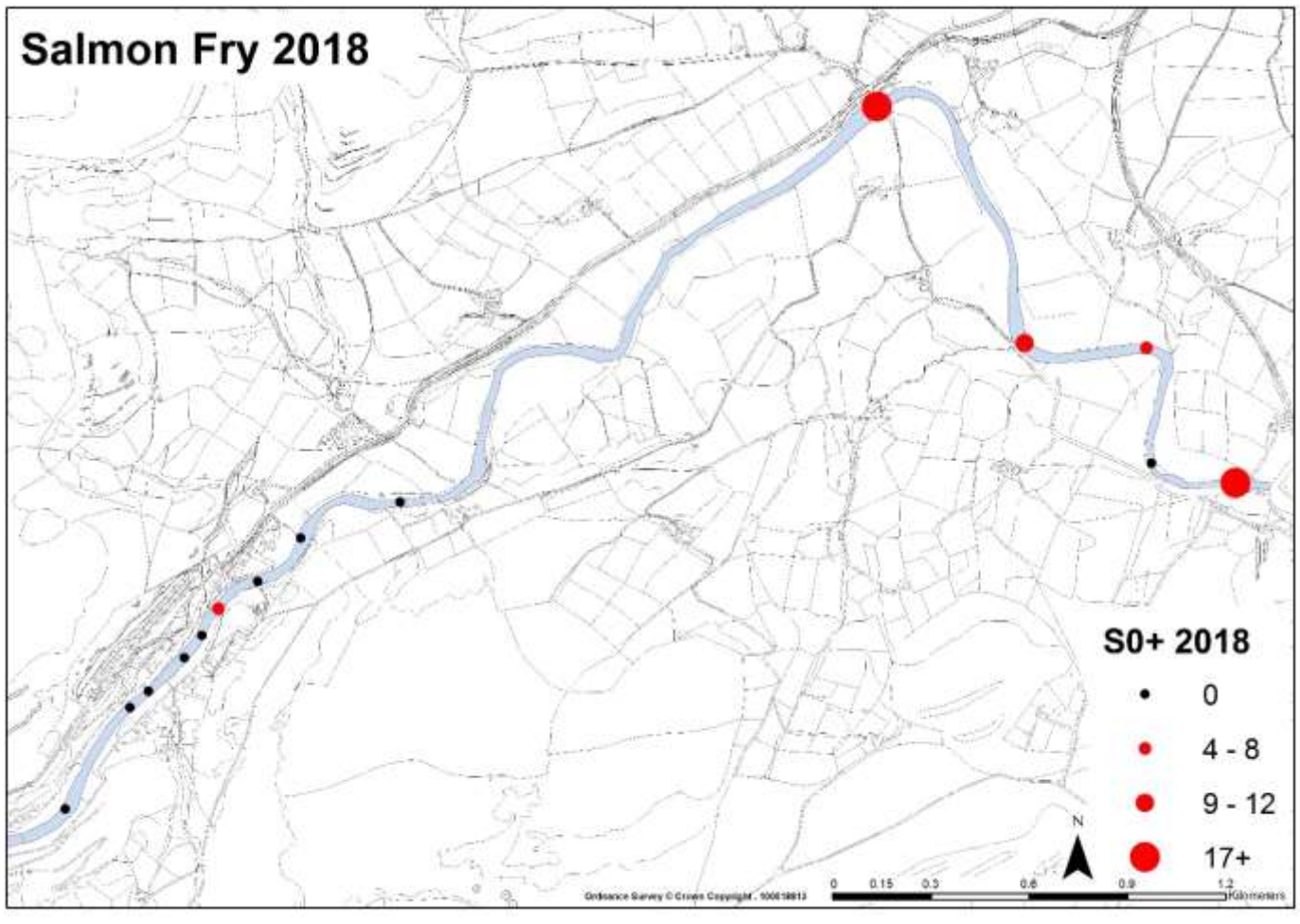
Electrofishing Surveys

River Elan Electrofishing Survey Results 2016 – 2018

Salmon Fry (<1 year old)

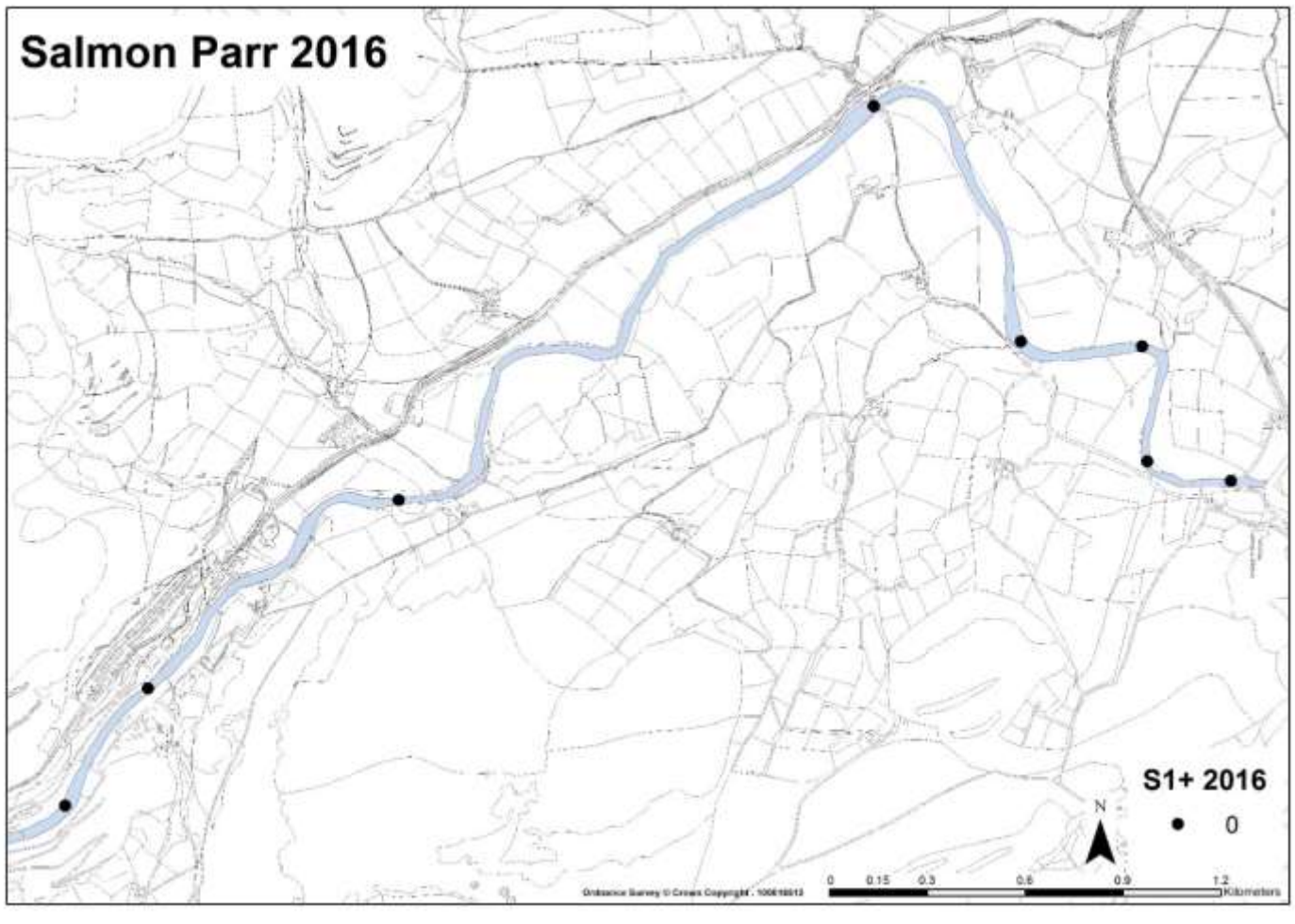


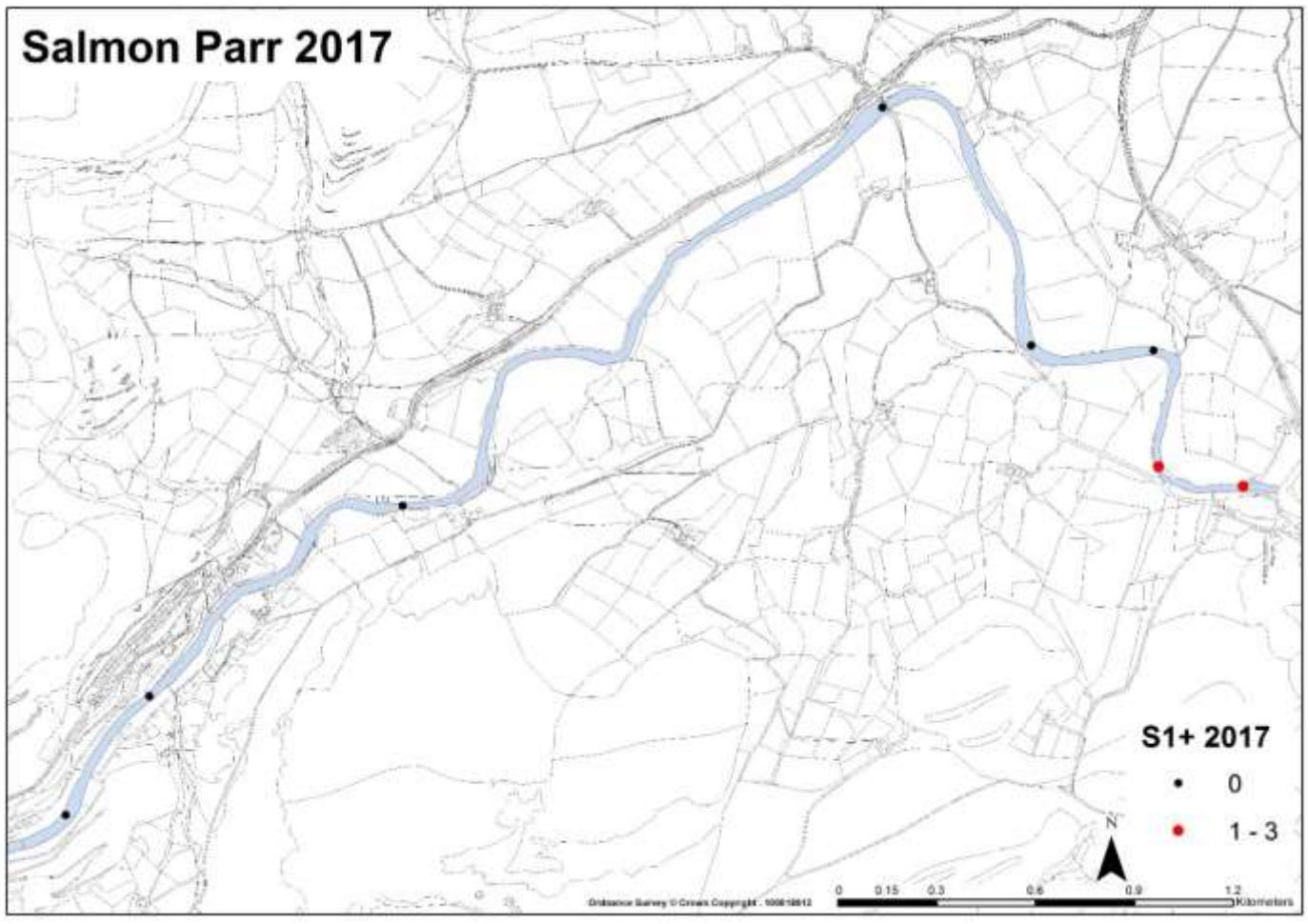


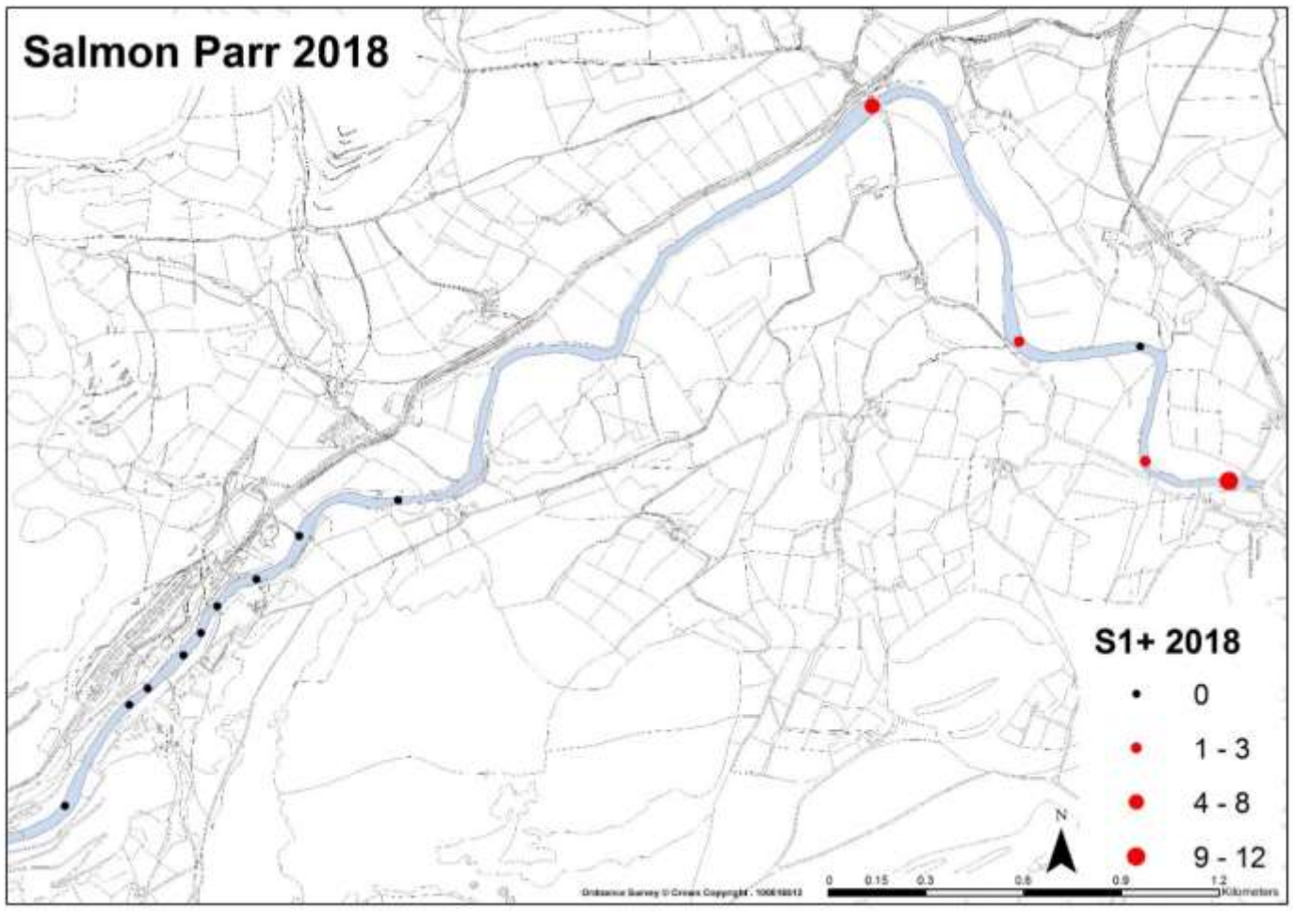


River Elan Electrofishing Survey Results 2016 – 2018

Salmon Parr (>1 year old)

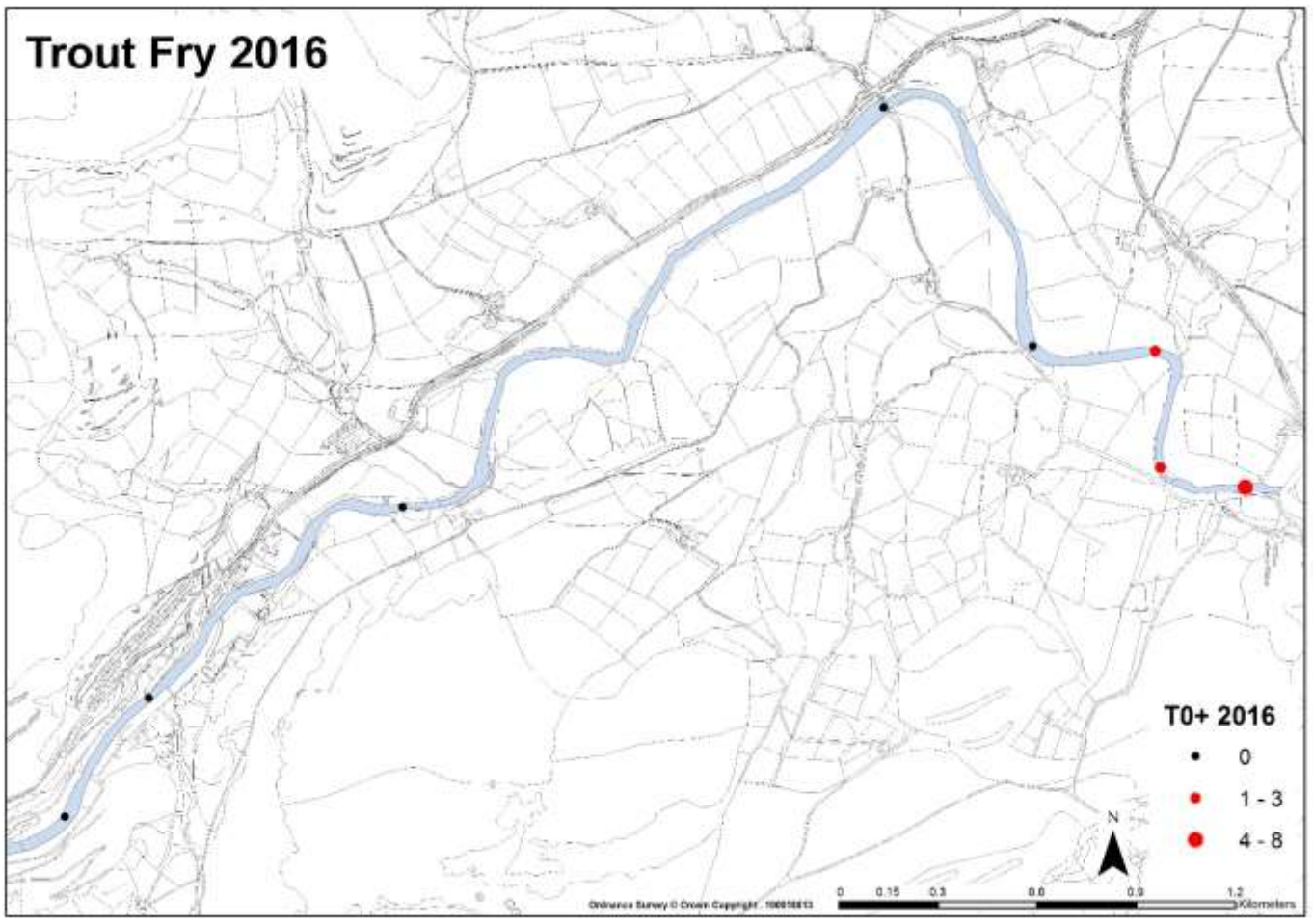


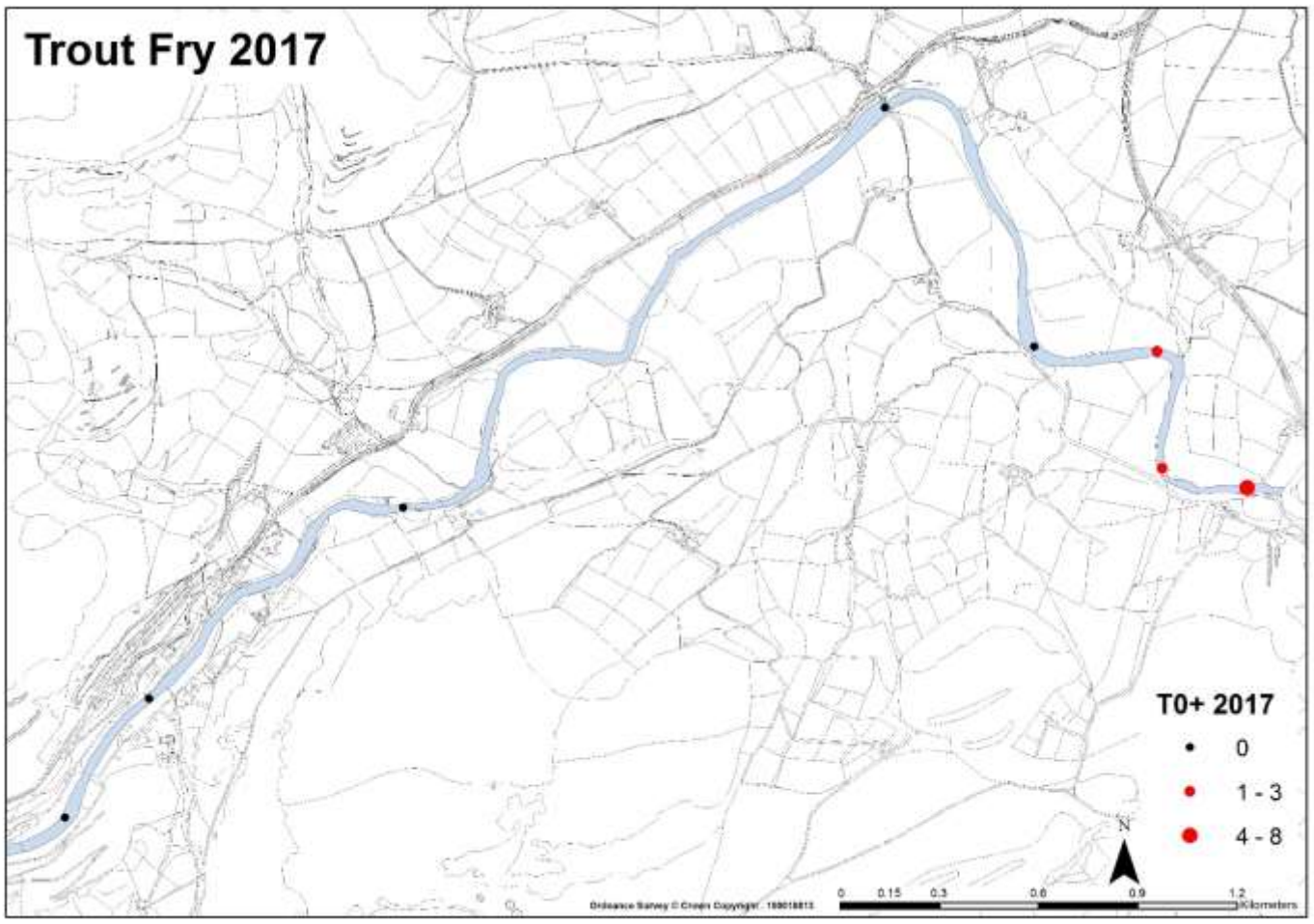


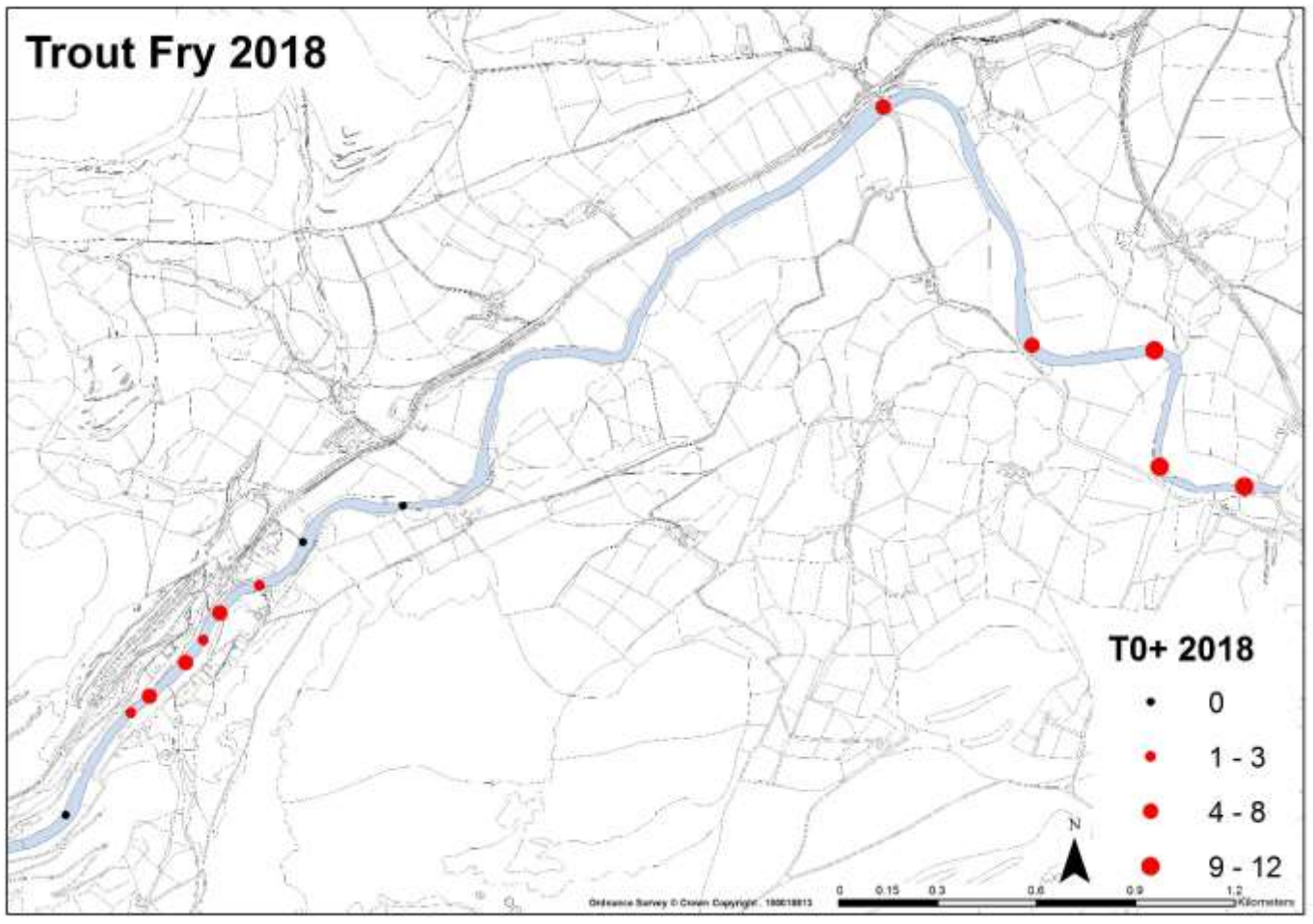


River Elan Electrofishing Survey Results 2016 – 2018

Trout Fry (<1 year old)

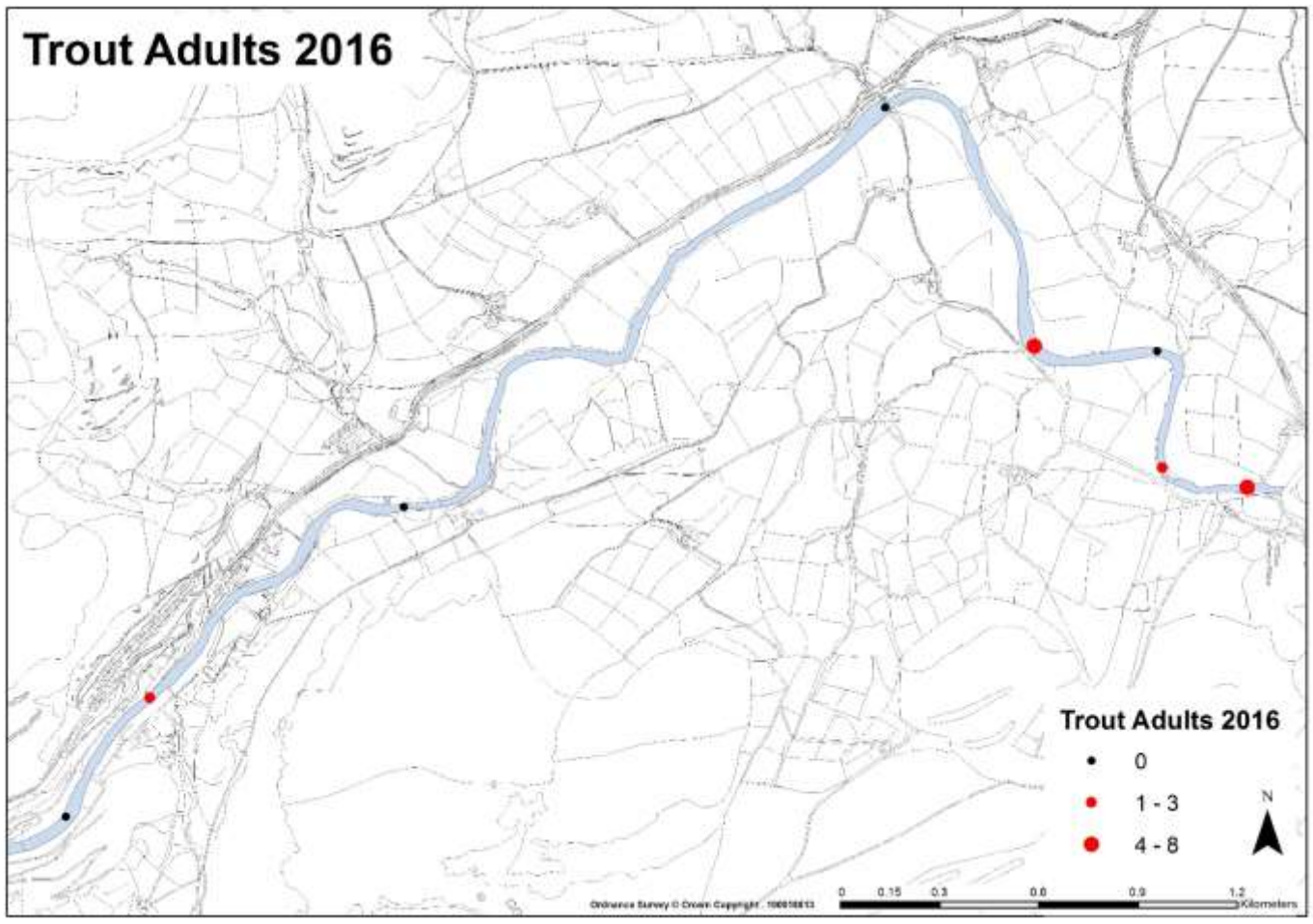


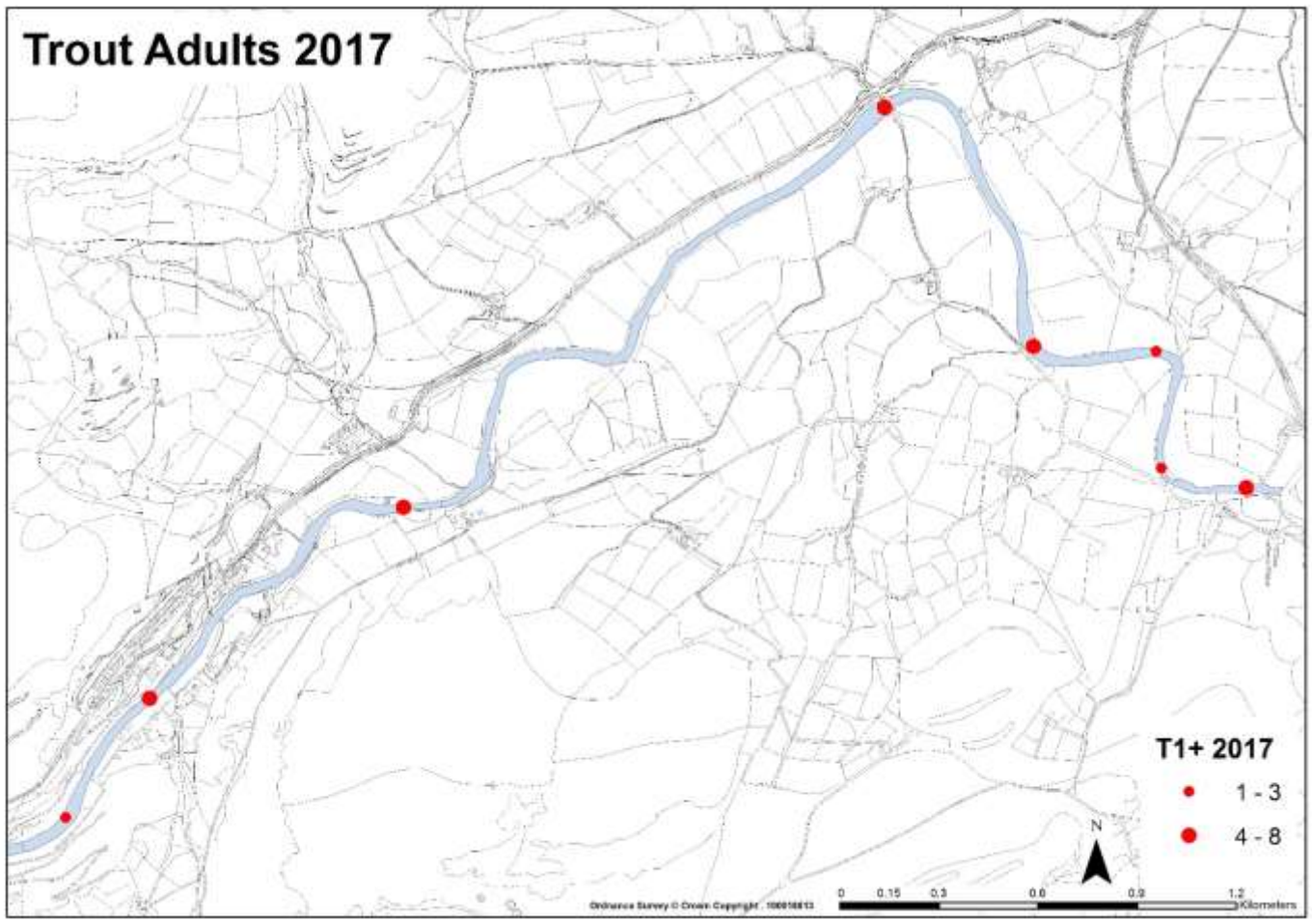


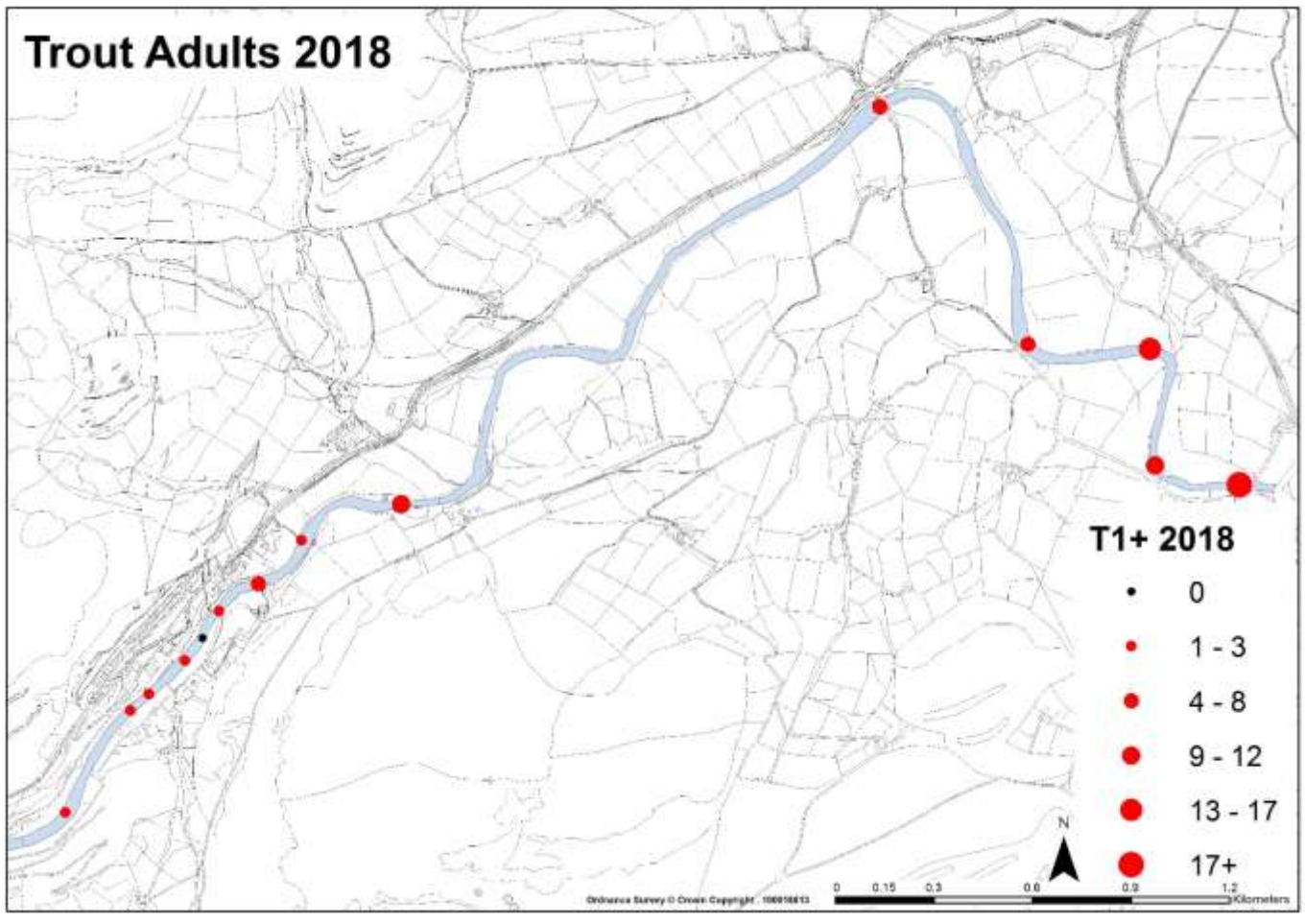


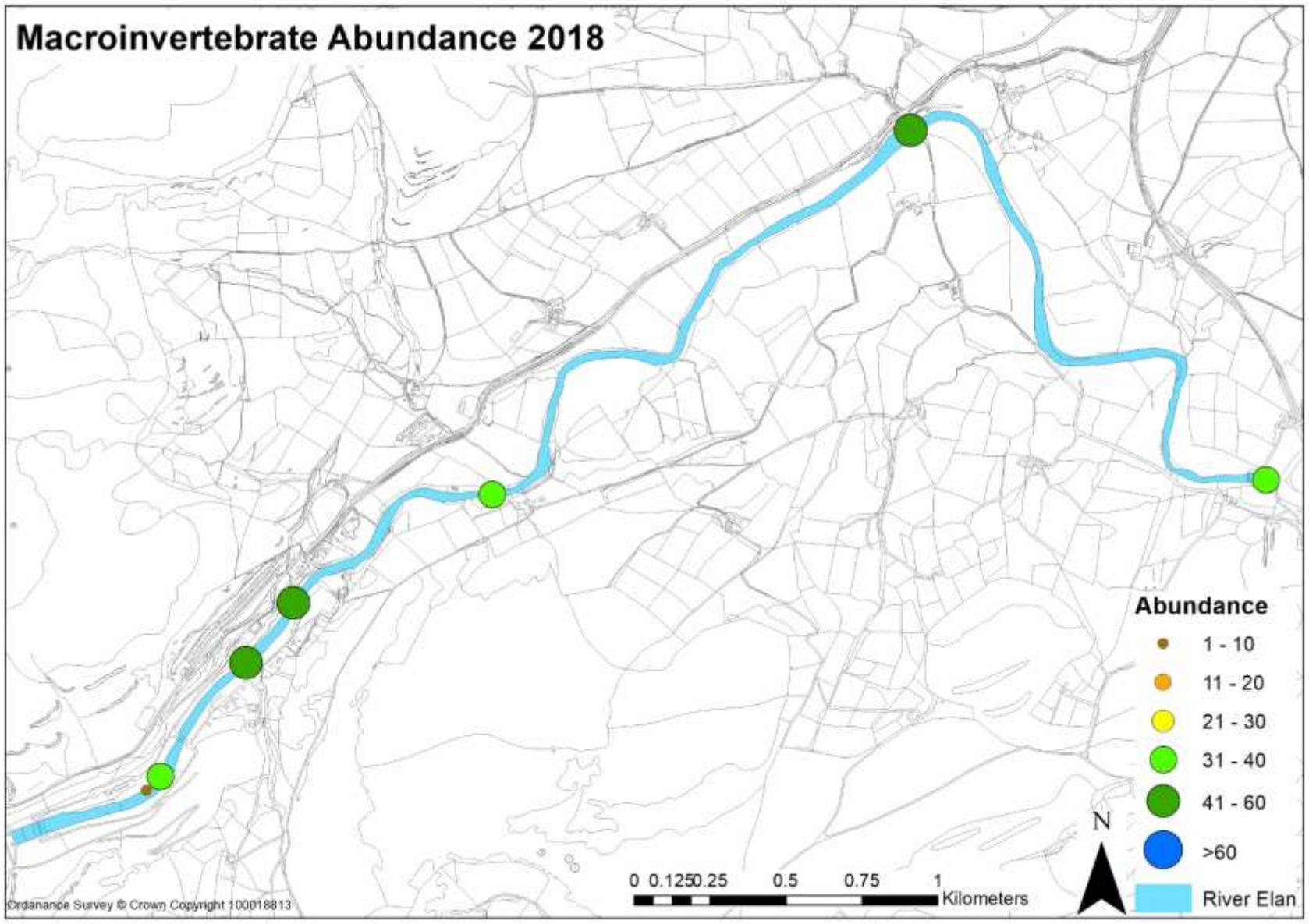
River Elan Electrofishing Survey Results 2016 – 2018

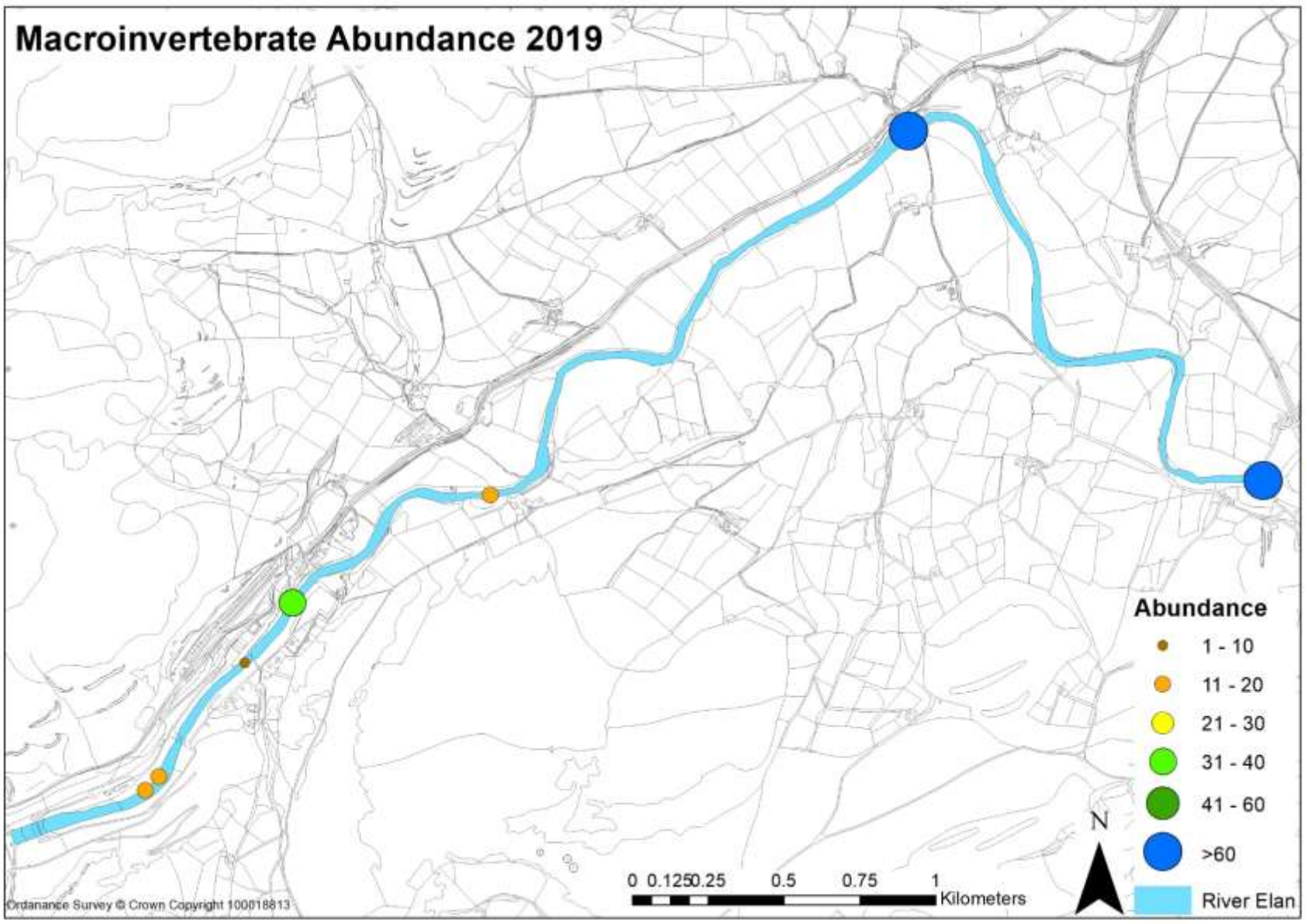
Trout Adults (>1 year old)








Macroinvertebrate Abundance 2018
Abundance
1 - 10
11 - 20
21 - 30
31 - 40
41 - 60
>60
River Elan
N
0 0.125 0.25 0.5 0.75 1
Kilometers
Ordanance Survey © Crown Copyright 100018813


Macroinvertebrate Abundance 2019
Abundance
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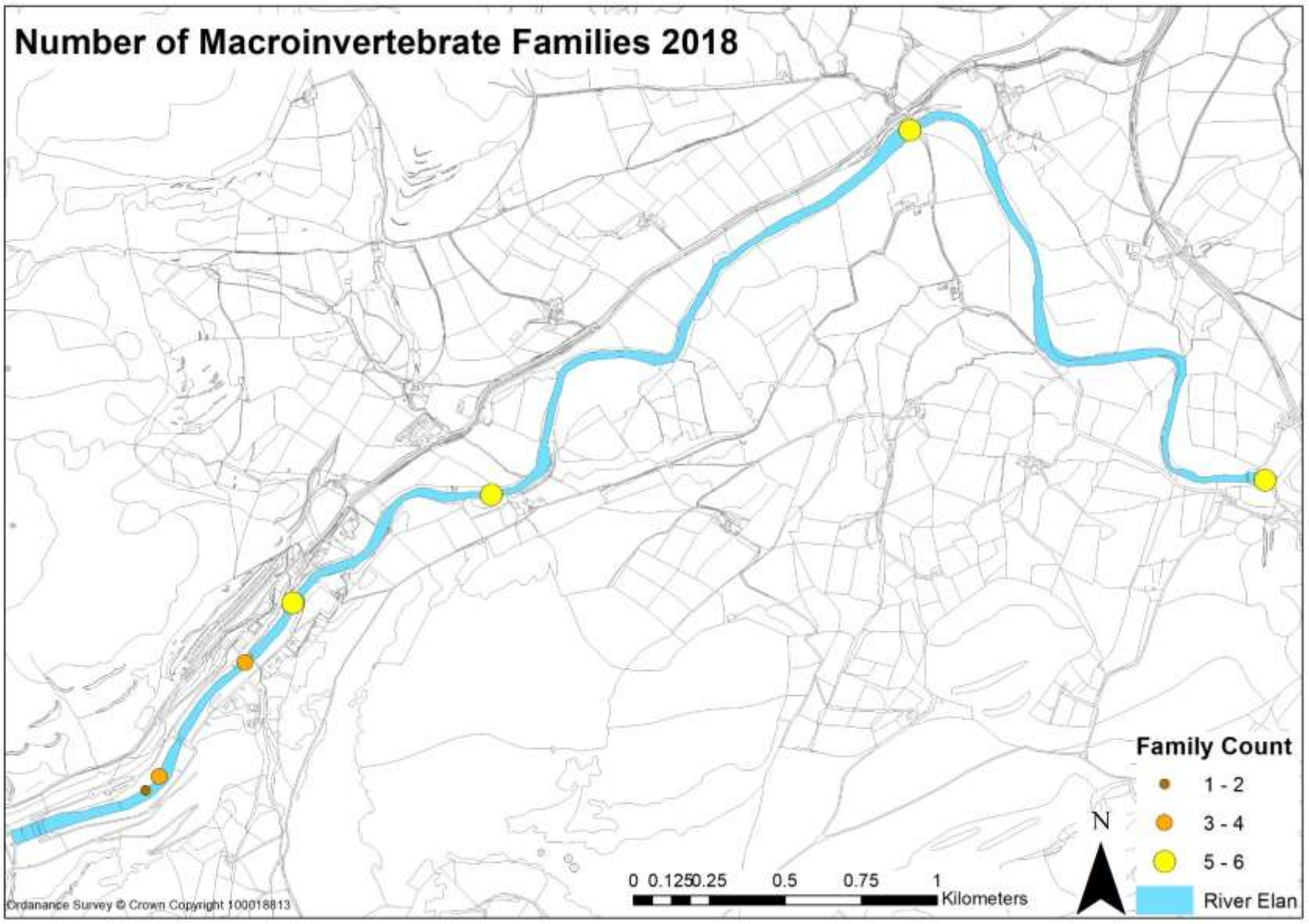
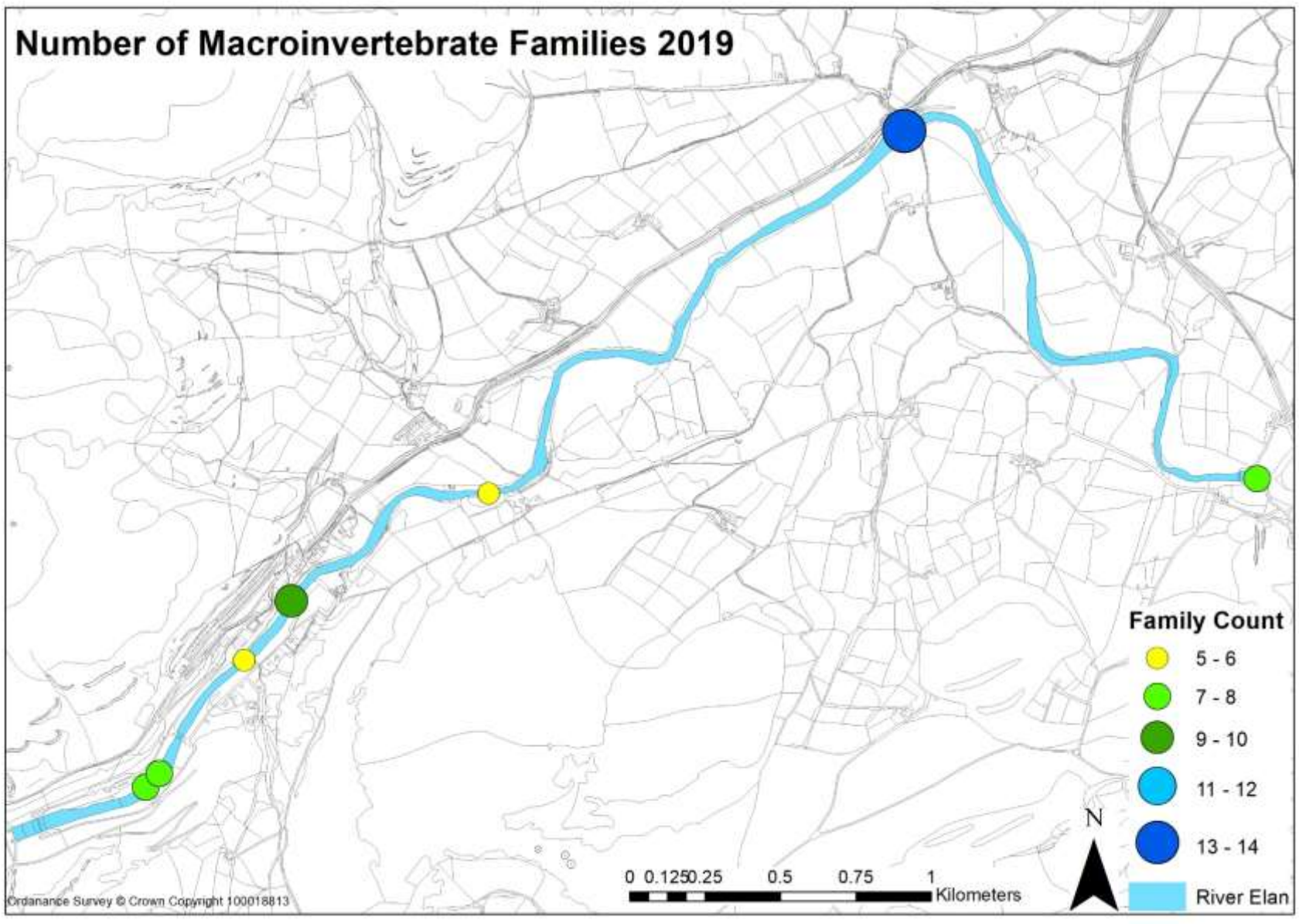
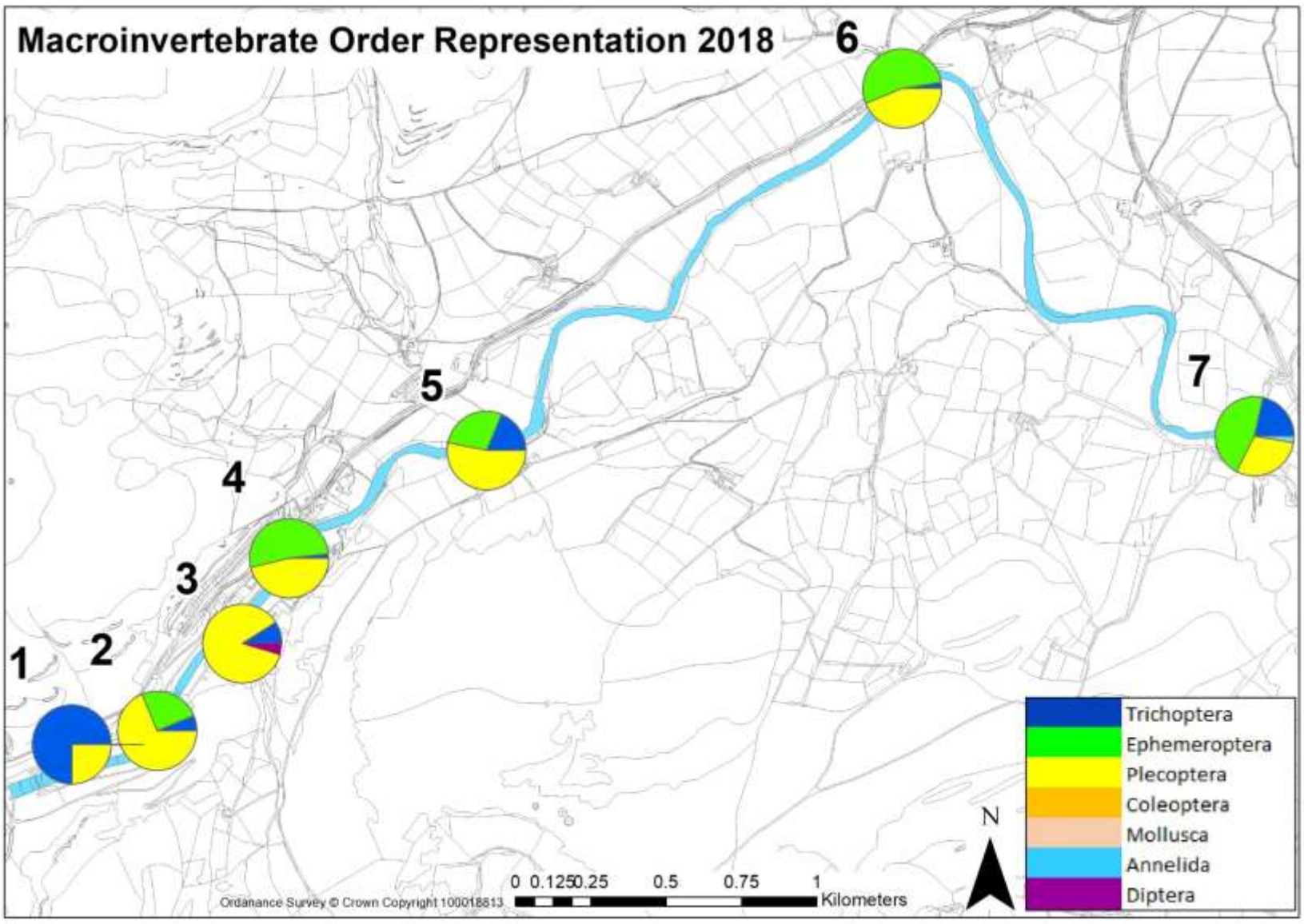
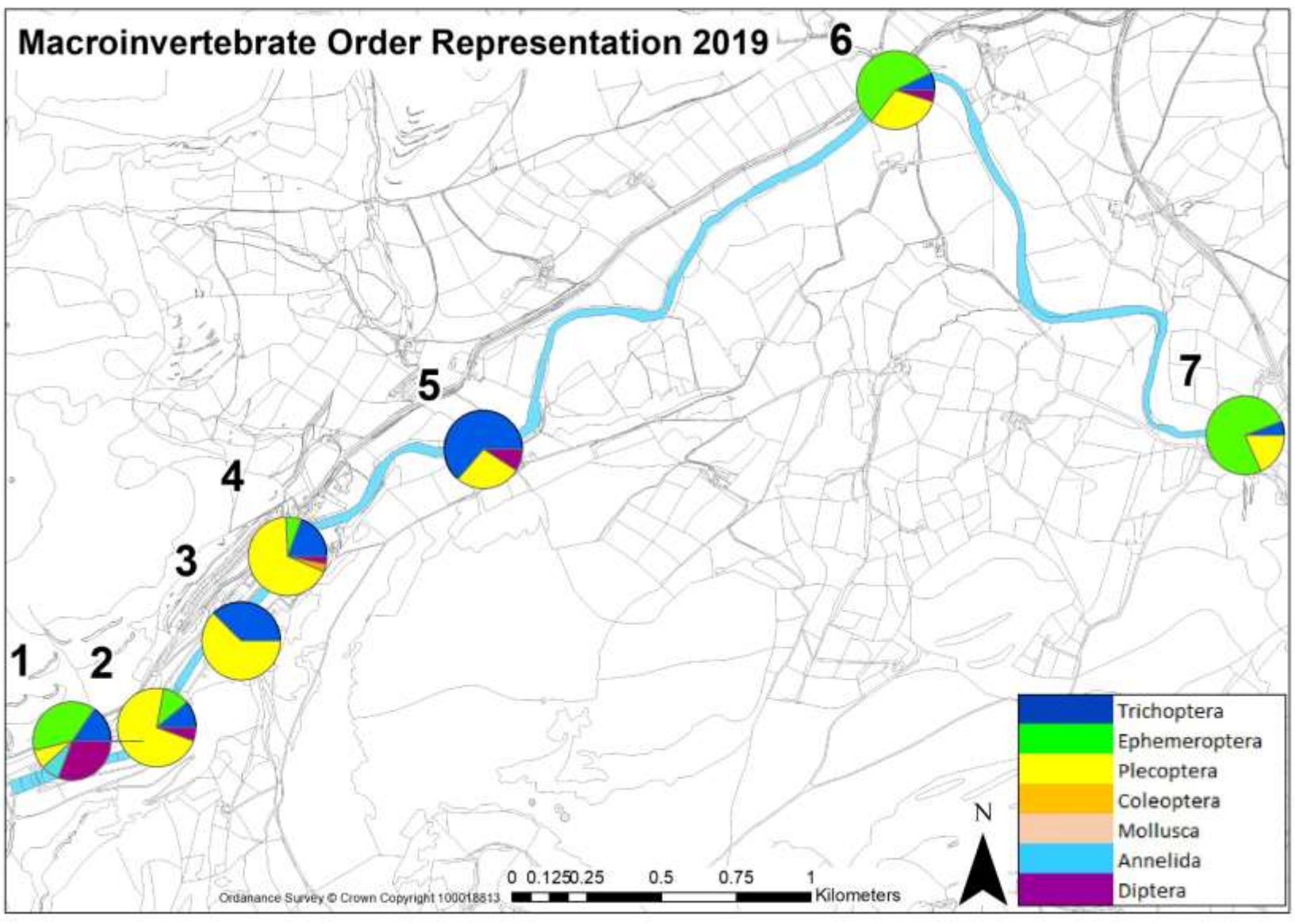
41 - 60
>60
River Elan
N
0 0.125 0.25 0.5 0.75 1
Kilometers
Ordanance Survey © Crown Copyright 100018813


Number of Macroinvertebrate Families 2018
Family Count
1 - 2
3 - 4
5 - 6
River Elan
N
0 0.125 0.25 0.5 0.75 1
Kilometers
Ordanance Survey © Crown Copyright 100018813


Number of Macroinvertebrate Families 2019
Family Count
5 - 6
7 - 8
9 - 10
11 - 12
13 - 14
River Elan
N
0 0.125 0.25 0.5 0.75 1
Kilometers
Ordanance Survey © Crown Copyright 100018813


Macroinvertebrate Order Representation 2018
1
2
3
4
5
6
7
Trichoptera
Ephemeroptera
Plecoptera
Coleoptera
Mollusca
Annelida
Diptera
N
0 0.125 0.25 0.5 0.75 1
Kilometers
Ordanance Survey © Crown Copyright 100018813


Macroinvertebrate Order Representation 2019
1
2
3
4
5
6
7
Trichoptera
Ephemeroptera
Plecoptera
Coleoptera
Mollusca
Annelida
Diptera
N
0 0.125 0.25 0.5 0.75 1
Kilometers
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