

# Gravelling the Elan System (GES) Project

## Year 2 Interim Report

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## 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 are for action to take place to correct this with the date for completion of these actions for SAC rivers being 22<sup>nd</sup> 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 the 2016 Operation**

The “End of Year One” report gave details of the slow progress made during the previous WUF project, Sir Maesyfed Salar 2012 (SMS 12), with regards obtaining the necessary consents to carry out gravel reintroduction into the Elan. The lessons learnt from this meant that the process of consenting the 2016 gravel operation with NRW, Powys County Council (PCC) and Dwr Cymru/Welsh Water (DCWW) was smoother, even if the upper Wye source sites were considerably further from the Elan than we originally anticipated.

At the end of September last year, we successfully removed and re-introduced 2,000 tonnes into the Elan just below the Visitor Centre. Much of the gravel was used to build a platform amongst the boulders from which plant could operate. The intention was that this platform would be distributed naturally by winter flows in October and November. However, the dry winter meant that this did not happen until February 2017, well after the salmon and trout spawning period. The rest of the gravel we introduced directly into the river.

Some concerns were raised about the amount of sediment washing down the Elan during the five-day operation of 2016, caused by our direct introduction of the gravel into the water channel. Despite this 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. This led us to changing the methodology slightly in 2017, as detailed later in the report.

Following the 2016 operation, the introduction site was cleaned up and new gates installed along the bank, securing it and providing an access point for future introductions. The redistribution of the new gravel throughout the lower Elan and the rapid recovery of the source site were detailed in the previous report.

### **2.2 This Year’s Operation**

The first part of 2017’s operation began, as it had the previous year, with a search for suitable gravel source sites. Despite the success of 2016, the cost of moving gravel from the upper reaches of the Wye’s main stem was estimated to be almost double that of sourcing it from within the Elan system itself.

At the beginning of June 2017 we again approached Elan Valley Trust (EVT) to ask them to reconsider the possibility the use of what we regard to be the natural source of the lower Elan’s gravel – the upper Elan (upstream of Craig Goch). Despite there being enough gravel in this area to supply the lower Elan for decades to come, at the end of June 2017 we received a response from EVT stating that the trustee’s had unanimously rejected the proposal.



The upper Elan upstream of Craig Coch: the very large and easily accessible gravel deposits are the natural source of gravel for the lower Elan

The site at Dolymynach, for which we had consent in 2016, was also considered. However, we remain unconvinced by the practicalities of taking this gravel and were unable to co-ordinate the lowering of levels in Caban Coch in conjunction with DCWW's work on Caban Coch dam wall. Further, the maximum yield of this site is only around 600-800 tonnes.

After receiving a further re-rejection from EVT to re-consider the gravels in the Claerwen, in between the Caban Coch and Claerwen reservoirs, we once again focused our search for suitable sources on the upper Wye. A return to the same source site as the previous year at Ty Mawr was considered, where the exceptionally helpful land and riparian owners were amenable despite, it must be stressed, gaining little from the project. However, we rejected this site on the grounds that it had not recovered fully from the 2016 extraction (around 60% of the bar had reformed) but could be a potential source from 2018 onwards.

In early July we visited a large gravel bar that could supply over 10,000 tonnes, just downstream of the Elan/Wye confluence. The owner there had initially been enthusiastic but at the site meeting he had changed his mind. Understandably, doubts over the effect of gravel removal on a property on the opposite bank just downstream were of a concern, as were the effects of a week-long operation on the residents of his holiday cottage.

Several more surveys were carried out without success and there seemed a strong possibility that no local source site would be found for 2017. Fortunately, an accessible gravel bar at Ddole Farm just downstream of Rhayader (Site 6) was identified in September, the landowner approached and his permission obtained. Geomorphological and environmental risk assessments were then carried out by Oliver Lowe and Jonathan Gilpin of NRW, while consents for the extraction were processed with equal efficiency by other NRW staff. Meanwhile, Sarah Jowett of DCWW was extremely helpful in securing at very short notice the licence we needed for the introduction site and special credit must be given to her for enabling this year's operation to proceed.

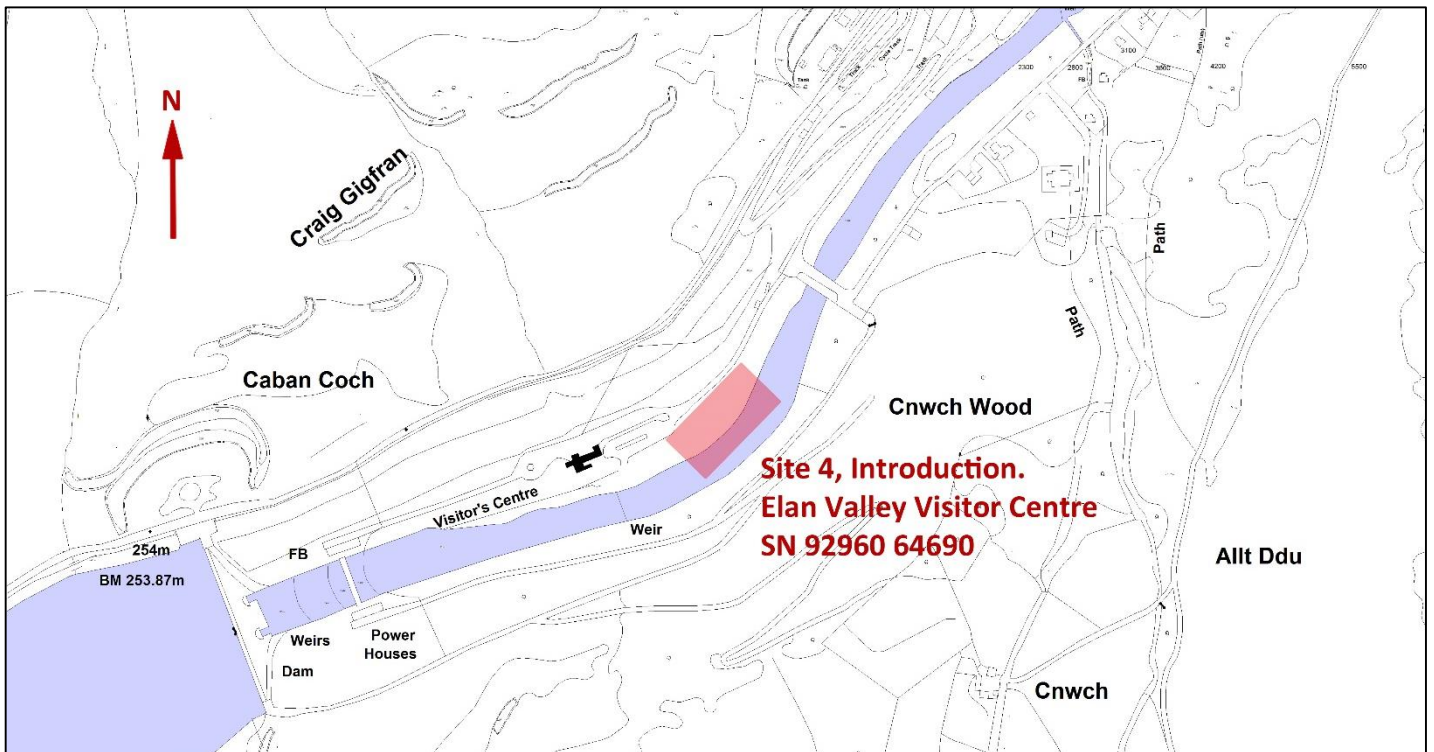
On Wednesday 11<sup>th</sup> October we began operations and, using the same tractors and trailers as last year, moved 340 tonnes of gravel from the Wye at Ddole to the Elan at Site 4 just downstream of the Visitor Centre over the next two days. Due to previous concerns about the release of fine sediment, the gravel was stacked on the side bar next to the river and was distributed by the high flows in late November and early December.

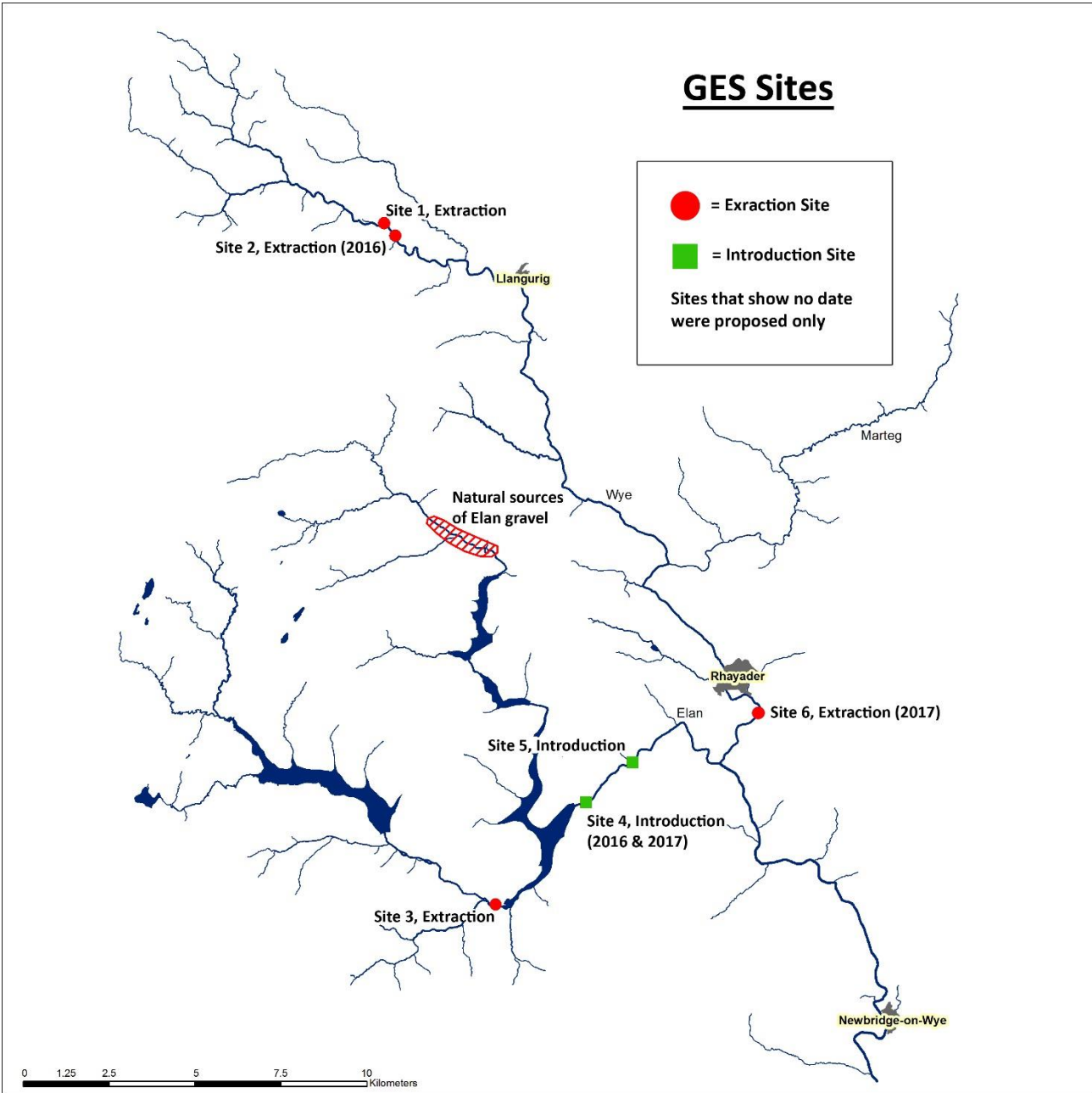
These high flows promoted considerable gravel movement in the main stem and the side bar that we extracted at Ddole Farm had completed reformed by the 5<sup>th</sup> December.

### 2.3 Extraction Site – Ddole Farm



## 2.4 Introduction Site, Elan Valley Visitor Centre





## 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 September 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	2 <sup>nd</sup> gravel deposition survey	March 2017	2 <sup>nd</sup> gravel deposition survey completed
March 2017	1 <sup>st</sup> year of project ends	March 2017	1 <sup>st</sup> 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		
March 2018	3 <sup>rd</sup> gravel deposition & 2 <sup>nd</sup> invertebrate surveys		
April 2018	2 <sup>nd</sup> year of projects ends – project report		



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.		
July to September 2018	Introduce 7,600 tonnes of gravel to Elan		
August 2018	2 <sup>nd</sup> electrofishing survey & 3 <sup>rd</sup> invertebrate survey		
Nov/Dec 2018	3 <sup>rd</sup> Elan redd count		
March 2019	4 <sup>th</sup> gravel deposition survey & 4 <sup>th</sup> invertebrate survey		
March 2019	3 <sup>rd</sup> year of project ends – final report submitted in April		

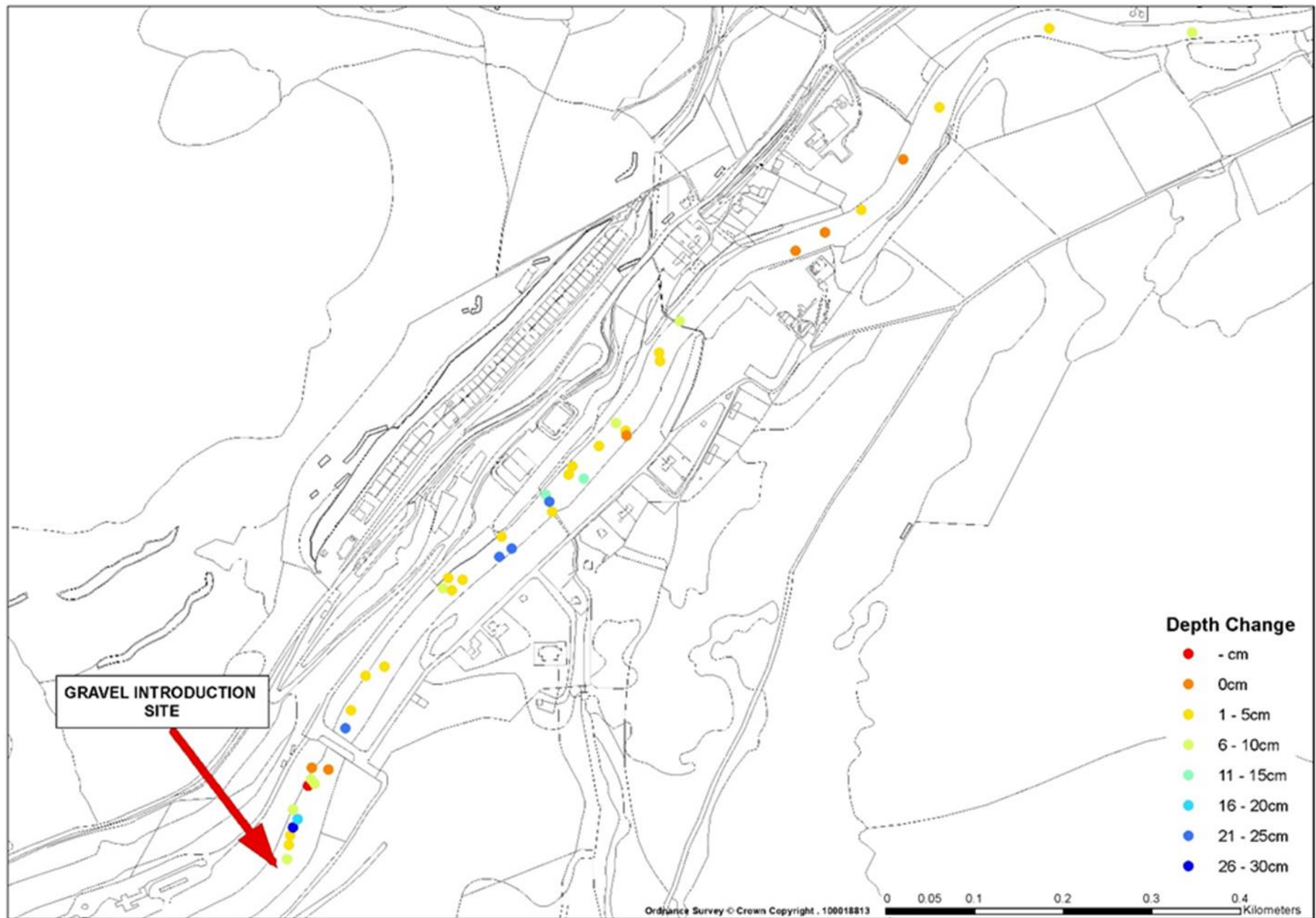
### 3. Monitoring Results in 2017

#### 3.1 Geomorphological Surveys

As detailed in our previous report, on 21<sup>st</sup> September 2016 our monitoring team surveyed 40 sites in the Elan for baseline data, measuring the depth between the top of fixed features (large rocks/weir) and the surrounding river bed. The same exercise was carried out on 21<sup>st</sup> March 2017 to assess the movement of the gravel from the first introduction.

Encouragingly, all but one of the sites that we surveyed showed an accretion of gravel in the areas of the Elan that you would expect to find in a natural river. As expected, one of the main areas was just upstream of the weir at Elan Village. The results are shown in the map on the following page. Most of the gravel was still within 420m of the introduction site and very little had moved more than 620m.

The next round of geomorphological surveys will be carried out in March 2018, which will be reported on in a further update.





The above photo is the Elan just downstream of the Visitor Centre prior to the project showing the river devoid of grave and fine sediment. The below photo was taken from the same place on December 5<sup>th</sup> 2017 and shows the build-up of gravel resulting from the two introductions so far.



### 3.2 Salmon Spawning

6 salmon redds were recorded in the lowest reaches of the Elan (below Glan Elan) in 2016. The limited penetration was probably due to the compensation flows in November and December following the lowering of Caban Coch in September 2016 and subsequent dry late autumn/early winter period.

In 2017 the situation reversed with the reservoir refilling and overtopping on the 21<sup>st</sup> November. Salmon were observed spawning at Dolfallen (3 redds) and below Glan Elan (4 redds) on the 26<sup>th</sup> November. A salmon was seen leaping outside the visitor centre shortly after and a fresh salmon redd was found on the introduced gravel on the 5<sup>th</sup> December. Flows had dropped by the 12<sup>th</sup> December enough to allow a full redd count but when we tried on the 13<sup>th</sup> December a sudden thaw caused the Elan to once more rise into spate. This rendered any further redd counting impossible due to the levelling out of the gravel that had been moved by spawning fish.

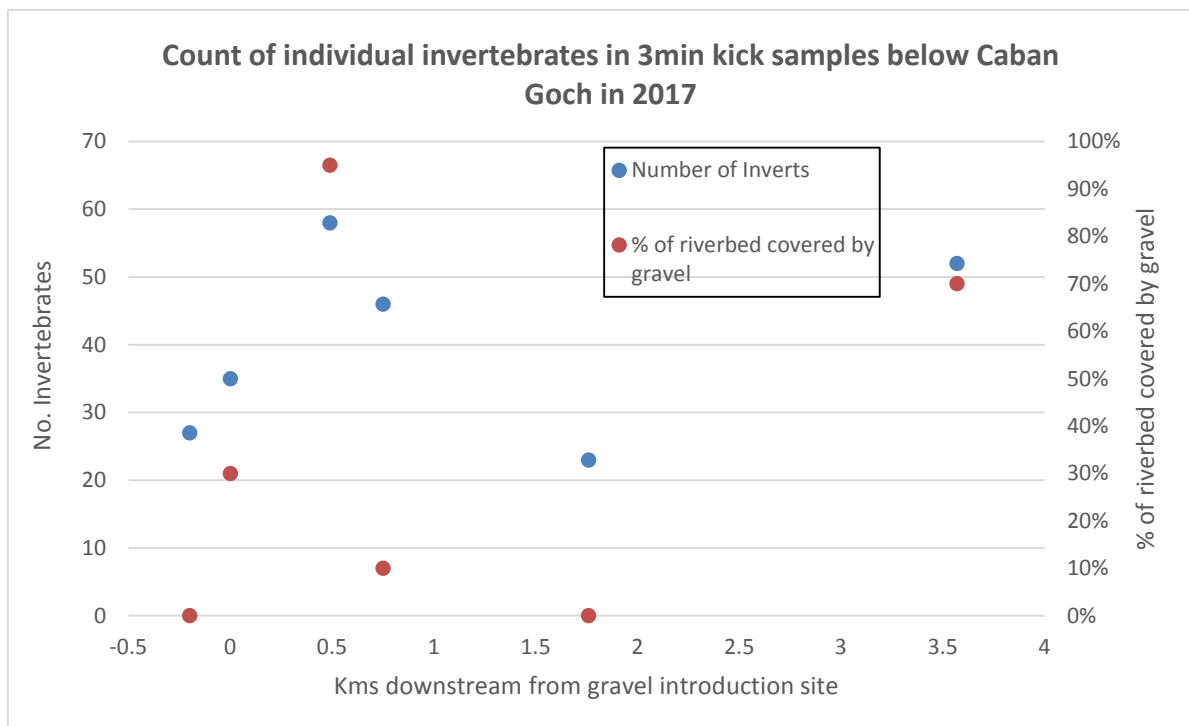


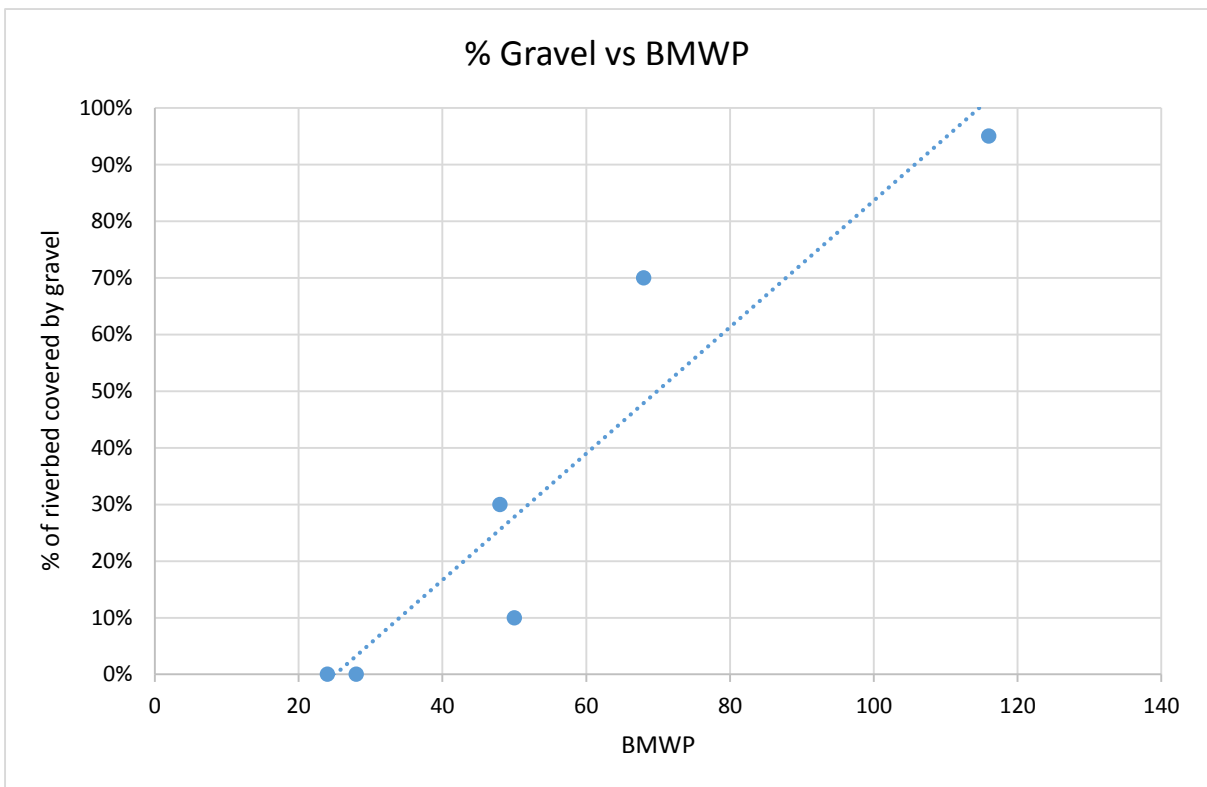
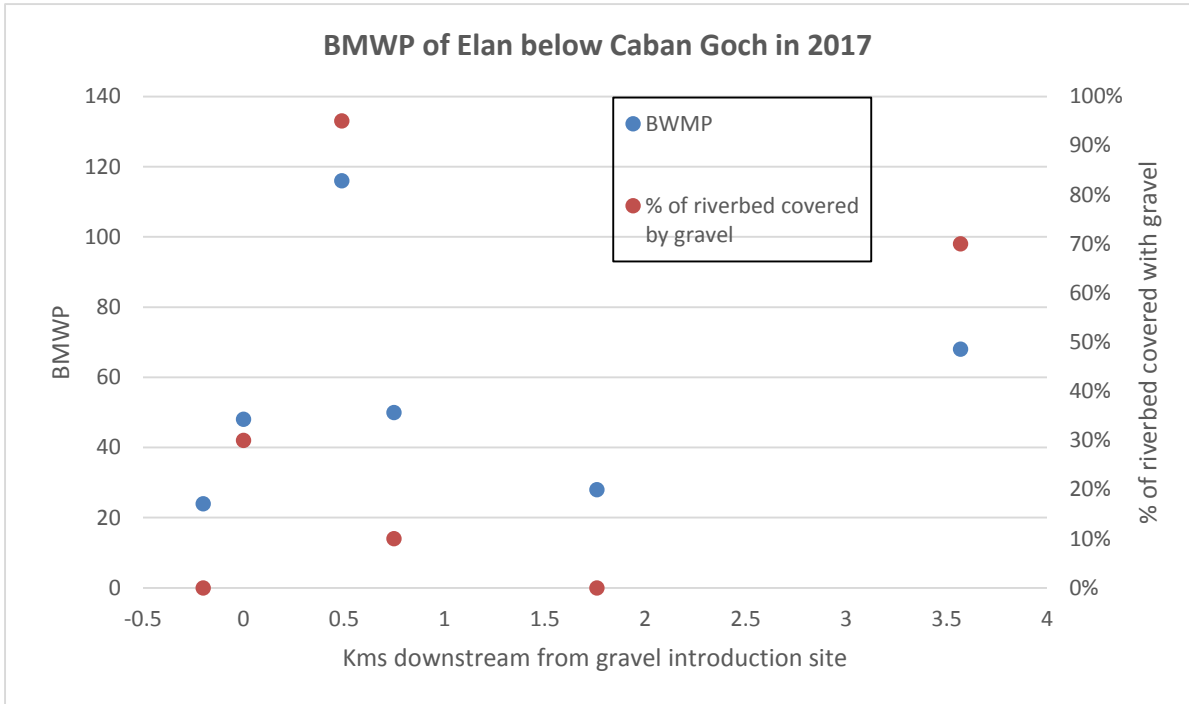
Salmon redd, cut into re-introduced gravel just below the visitor centre. 5th December 2017.

### 3.3 Invertebrate Monitoring

On 20th September 2017 we carried out the first of the invertebrate monitoring in the Elan. Surveys were carried out to measure the number, quality and diversity (BMWP) at sites where the new gravel had accumulated (mostly from 0 to 0.6kms downstream from the introduction site), at sites where old gravel remained and at those that were devoid of it. Comparisons were then made and, encouragingly, these showed that both the invertebrate count and BMWP was significantly improved in areas where gravel had accumulated.

The graphs below clearly show that the September survey found a clear correlation between the % of the Elan's riverbed covered in gravel and invertebrate numbers along with BMWP. Follow-up sampling will be carried out in the spring in conjunction with the geomorphological surveys.





### 3.4 Electro-fishing

In early September 2016 eight sites on the main stem of the Elan between the introduction site and the junction with the Wye were semi-quantitatively electro-fished to establish a baseline (as reported in March 2017).

We followed this with further electrofishing surveys in the same sites in August 2017. The results from both sets of surveys are shown in the tables below.

The tables show two points of interest. Firstly, that salmon and trout spawning dropped further down the Elan last winter (red circle). This was probably due to the existing gravels being further depleted and that the especially low winter flows had two effects: that spawning fish did not penetrate very far up the river and that much of the new gravel introduced was not distributed in a “natural” way until the first real winter flows in February. Indeed, much of the gravel remained stacked on the bank and wasn’t distributed by the river until February 2017.

The second point is the increase in adult trout found immediately downstream of the introduction site (green circle). This is most likely fish that have moved into this area because of the better feeding opportunities resulting from the increase in invertebrate numbers and BWMP.

2016	Salmon Fry	Salmon Parr	Trout Fry	Trout Adults
Gravel Introduction site	0	0	0	0
Upstream 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
Upstream 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 Jct	11	2	5	6

## 4. Project Finance

		Year 1	Year 2	Year 3	Total 2&3	Budget 2&3
<b>Income</b>						
	DCWW	19,773	20,000	20,000	40,000	<b>40,000</b>
	WUF	0	9,172	267	9,439	<b>9,439</b>
	NRW	19,782	0	52,000	52,000	<b>52,000</b>
	EVT or in Kind	0	0	10,000	10,000	<b>10,000</b>
	<b>Total</b>	<b>39,555</b>	<b>29,172</b>	<b>82,000</b>	<b>111,172</b>	<b>111,439</b>
<b>Expenditure</b>						
	Direction	3,324	3,876	3,775	7,651	<b>30,404</b>
	Project Management	3,778	5,718	3,200	8,918	
	Head of Land Management	37	5	0	5	
	Head of Ops	4,200	2,450	7,795	10,245	
	Habitat Staff	1,977	585	10,946	11,531	
	Finance & Admin staff	1,425	3,979	3,086	7,065	<b>3,648</b>
	Monitoring	451	1,815	2,400	4,215	<b>12,667</b>
	Materials	3,747	486	9,900	10,386	<b>11,955</b>
	Equipment hire	15,697	1,264	39,000	40,264	<b>40,000</b>
	Other costs	0	1,311	0	1,311	
	Travel	1,345	377	1,620	1,997	<b>3,370</b>
	Overheads	2,686	2,397	5,456	7,853	<b>9,395</b>
	<b>Total</b>	<b>£38,668</b>	<b>£24,261</b>	<b>£87,178</b>	<b>£111,439</b>	<b>£111,439</b>

## 5. Y1 & Y2 Summary and Looking Forward to Y3

This year, for reasons explained above, we introduced less gravel than we hoped, but we have the budget to complete the project in full next year.

The monitoring is showing the ecological results we were expecting in the Upper Elan. Macro-invertebrate numbers are increasing in line with the amount of gravel accreting and adult trout are taking advantage of this increased food source. We look forward in some anticipation to next year's electrofishing to see if it will confirm the presence of juvenile salmon in the upper Elan for the first time in more than 60 years.

This project is becoming well known across the UK and offers excellent publicity for all involved. It is a worthwhile endeavour both for the Elan and as an exemplar project for other impounded rivers across the UK. We hope that the positive ecological results, the refinements to the methodology and the evidence of the rapid recovery of the donor sites is proof of this. Also, that it has now been demonstrated just what could be achieved if we were able to source more substantive amounts of gravel.



This sentiment is reinforced further by the fact that the lower Elan represents a significant amount (18ha or 7%) of the Wye's salmon spawning area and that the potential juvenile fish habitat has perhaps become even more important to Wye salmon populations in recent years. It is widely accepted (by NRW & WUF) that the extremely poor salmon spawning of the winter of 2015/16 across England and Wales was most likely due to climate and, in particular, the warmest December since at least 1910. For the river Usk, where December temperatures were 5°C above average, the winter's spawning was especially bad. The only Usk tributary where "normal" populations of salmon fry were found in the 2016 surveys was the lower Caerfanell, the Usk tributary that flows out of Talybont reservoir.

Luckily, the upper Wye escaped the worst of the climatic extremes of the 2015/16 winter and the salmonid spawning was not affected to such a degree. Climatic uncertainty is, however, predicted to worsen. The thermal damping below the Elan reservoir complex could provide protection for Wye salmon from future extremes of temperature, but only as long as there is an adequate amount of gravel.

For this project to achieve its maximum impact we believe that the large gravel deposits at the top of the Elan (upstream of Graig Goch) remain the best option for sourcing the amounts required at a reasonable cost. We understand and appreciate that the area is designated, that there may be issues with tenant farmers and that there are concerns over potential geomorphological change. However, none of these issues are unique to the upper Elan and all have been overcome or managed in the extraction sites on the Wye SAC. With regards to the geomorphology, we have an independent expert who would be willing to carry out surveys and assessments if required. We hope that this will satisfy the concerns of EVT and allow them to reconsider their decision, bearing in mind the project's monitoring results to date.

The evidence so far leads us to believe strongly that the GES project is the means by which the lower Elan can achieve Good Ecological Potential. Whether we can introduce the amounts necessary to achieve maximum impact is in doubt though. It would be a great shame if such a pioneering project were to under-achieve, given that the positive results anticipated are starting to be realised.

A further report will be submitted at the end of Year 3 in December 2018, with updates on redd counting, gravel deposition surveys, invertebrate surveys and an interpretation board at the introduction site. In the meantime, we remain extremely grateful to DCWW and NRW for delivering their roles so well in the partnership that is delivering this work. If DCWW would like to have the results of this work presented at an IEAP we would be happy to do so.

The Wye & Usk Foundation  
December 2017.