Addingham 4 Becks Project

Phase one report
October 2019

Wharfe Flood Partnership Resilience and Stewardship Programme

Submitted by:

Dr. Marie J. Taylor Project Officer Yorkshire Dales Rivers Trust

Conor Scholey Assistant Project Officer Yorkshire Dales Rivers Trust

Charlotte Simons Senior Catchment Coordinator Yorkshire Dales Rivers Trust

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Project Overview

The Addingham 4 Becks project has been developed by the Yorkshire Dales Rivers Trust (YDRT) and the Addingham Environment Group. This is a Mid-Wharfe pilot project in Wharfedale, showing how a community-led partnership can build flood resilience in Addingham, using Beck Stewards to gather information, building on existing relationships and raising awareness of how rivers work.

Project Area

There are four main becks in the parish of Addingham (Figure 1).

- Town Beck
- Back Beck
- Winebeck
- Lumb Ghyll Beck

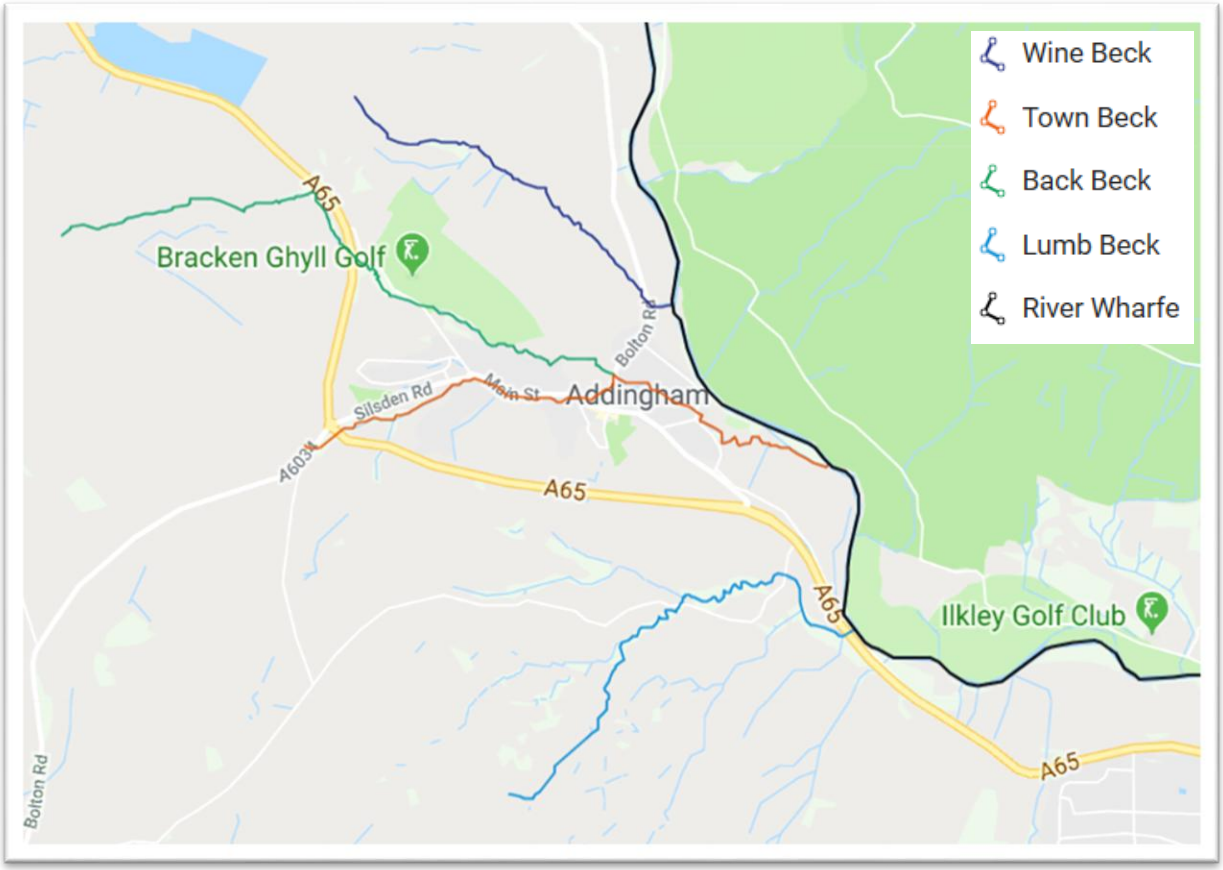


Figure 1. A map showing each of the Addingham four becks (Wine Beck, Back Beck, Town Beck and Lumb Beck) and the River Wharfe.

Town Beck (that starts as Marchup Ghyll) is joined by Back Beck in the centre of the village and flows into the Wharfe at Low Mill. Town Beck is heavily modified as it passes through the village by the presence of multiple weirs, culverts and drains carrying surface runoff. In contrast Wine Beck and Lumb Ghyll Beck flow almost entirely through farmland before joining the Wharfe. These Becks form a sub-catchment of the Wharfe from Barben Beck/River Dibb to Hundwith Beck waterbody within the Wharfe catchment.

Overall Aim

To recognise the place that the four becks (Town Beck, Back Beck, Lumb Gill Beck and Wine Beck) have in Addingham and the wider countryside and to make them a focal point of the village and surrounding countryside with residents understanding their value in terms of habitat, biodiversity, water quality and their role in reducing flood risk.

Objectives

Community engagement

To find out how Addingham residents see the becks and how they would like to see them in the future.

To craft them into village life with the local community making decisions on, and being involved in, positive changes to their management.

To increase the enjoyment of the becks with more people having contact with them and enjoying the contact with nature.

Habitat improvement

To make the becks more natural with more fish, birds and mammals using them and more places for wildlife to live and thrive.

To reduce the presence of invasive non- native species such as Himalayan Balsam and Japanese Knotweed.

Reducing Excess Water

Understanding the impact of recent floods on Addingham by asking who got flooded and where, how high it was and how long it lasted and collating the answers into a record.

Using the records gathered to see what can be done to reduce the amount of excess water in the village, considering natural flood measures (NFM) upstream and Sustainable Urban Drainage Systems (SuDS) in the village to slow the flow of water and reduce the amount of damage.

Water Quality

Finding out what the quality of the water is in the becks with volunteers involved in water sampling and looking at the impact of village life on the becks.

Making the results available to all so that more people understand their impact on the becks and what they can do to improve them

Programme of work

Raising awareness and understanding

Task 1. Design and distribute a questionnaire to assess residents' concerns and understanding of flooding and flood risk using the Boxing Day 2015 as a case study (stewards and PO). Collate and summarise the results and provide feedback to residents and stewards (PO) followed by a public meeting.

Task 2. Prepare and staff a stand at the village Environment Day on June 30th promoting the 4Becks Project. Include a focus on flood risk and distribute a questionnaire on flooding (see Task 3 below). (Stewards).

Task 3. Prepare and staff a stand at the village Gala in July. Include a focus on flood risk and distribute a questionnaire on flooding (see Task 1) (Stewards).

Task 4. Organise three drop-in sessions open to the wider Wharfedale community on the themes of "Water flows and flooding", "Water quality" and "Plants and Wildlife" (PO, 4Becks SC and Stewards).

Gathering and generating information

Task 5. Develop the Beck Steward programme already in place by providing training in mapping surface water drains, inflows, culverts and weirs, measuring flow, identifying invasive species, identifying aquatic plants and animals and recording results on spreadsheets (PO and Stewards).

Task 6. Carry out surveys of the project area and generate data on rainfall-flow relationships by measuring rainfall (using a standard rain gauge at the top of the catchment), mapping all water sources, springs, storm drains and flow-paths and installing a new beck-level recording station on Lumb Ghyll Beck for comparison with the existing recorder on Town Beck (PO, and Stewards). Landowner's permission to install a new beck level recording station has already been obtained.

Task 7. Assess water quantity – water quality relationships by sampling all four becks and surface water drains at different water levels for soluble reactive phosphate (SRP), total phosphorus (TP), nitrate, turbidity and biochemical oxygen demand (BOD)) (PO and stewards), with samples analysed by the EA laboratory in Exeter.

Task 8. Set up a database to store all data on beck levels, flow velocity and discharge, water quality (determinands as above Task 3), plant and animal populations and historical records.

Task 9. Develop a GIS for mapping the catchments of all four becks adding layers for water flow, channel morphology, water quality, invasive species, vegetation and land-use, land ownership etc (PO).

Outputs

The main output of the project will be a Community led Flood Risk Management plan, which will identify local actions to reduce the risk of flooding to the community and will link into and strengthen the flooding aspects of the Communities Emergency plan. *Additional outputs supporting this will be*

Task 10. Build a 4Becks Project web-page to provide up-to-date information on all activities and to hold documents (maps, report, walks) for downloading, hosted on the AEG website (PO).

Task 11. Generate a report including a description of the work undertaken along with summary maps of the beck system, water quality, land-use etc (PO).

Task 12. Design and make available (hard copy and electronic copy) one or more village beck walks linking together points of interest along the becks backed up by more detailed information on the website (PO and Stewards).

Task 13. Raise awareness about SuDS across the village by demonstrating the YDRT's SuDS house at the Environment Day, producing a leaflet that describes what can be done to slow or prevent surface water from paved areas entering the becks and recruiting volunteer householders to host demonstration systems (PO and Stewards).

Task 14. Assess potential for NFM by catchment walkovers, holding discussions with landowners, mapping potential sites and using hydrological data to model effectiveness (PO).

Task 15. Produce a guide for residents on how to make Addingham more resilient to future flooding, describing the methods residents could use to prevent damage, to raise awareness of the village Emergency Plan, how help can be obtained, where equipment is stored and how it can be accessed. Publicise at a village meeting (PO and Stewards).

Delivery of tasks

Raising awareness and understanding

Task 1. Design and distribute a questionnaire to assess residents' concerns and understanding of flooding and flood risk using the Boxing Day 2015 as a case study. Collate and summarise the results and provide feedback to residents and stewards followed by a public meeting.

The questionnaire was designed, both paper copies and online surveys were available (Page 16 & 17), there were a total of 79 responses. The information helped us to understand residents' experiences around flood events in Addingham. The data was collated and presented at the water and flooding drop-in session, part of Task 4.

What we learnt from the questionnaires (Pages 18 - 27):

- 50% of the flooding was reported to be seen on Town beck
- The four main reasons for flooding were due to surface run-off (26%), over land run-off (22%), groundwater rising (22%) and becks over topping (18%).
- 65% of the responses had been flooded on boxing day 2015
- Over 50% of the residents that responded had experienced flooding previously
- 65% of the responses said that they didn't receive any warnings on boxing day 2015 and on any other occasion
- 64% have taken out measures to reduce the risk of flooding in the future, 30% have installed pumps.
- Only 23% of residents who responded are planning on doing anything to reduce the risk of flooding, 8% said they wouldn't know what to do.
- 77% were not aware of the Community Emergency and Flood Plan
- 67% had not signed p to the Environment Agency flood warning service
- 81% didn't know who to contact in the event of a flood
- 66% believe flood risk is increasing and nearly 50% of them think it's due to climate change

Task 2. Prepare and staff a stand at the village Environment Day on June 30th promoting the 4Becks Project. Include a focus on flood risk and distribute a questionnaire on flooding (see Task 3 below). (Stewards).

Figure 2. Picture of Addingham Environment Day, June 2018

Two environment day events were attended, one in June 2018 and the other in June 2019. Paper copies of the flood questionnaire were distributed in 2018. YDRT brought along the SuDS house with an information leaflet about water friendly homes (Figure 2). This helped to raise awareness about SuDS and what residents can do to make their homes more water friendly. The YDRT mobile classroom was at both events, it helped residents to learn and understand about river processes using the river table. These two events were well attended, it helped to promote the project and raise the profile of the becks.

Task 3. Prepare and staff a stand at the village Gala in July. Include a focus on flood risk and distribute a questionnaire on flooding (see Task 1).

This event was successful, Beck Stewards helped to distribute questionnaires, provide information about the project and what they do as volunteers.

Task 4. Organise three drop-in sessions open to the wider Wharfedale community on the themes of "Water flows and flooding", "Water quality" and "Plants and Wildlife" (PO, 4Becks SC and Stewards).

The tree drop-in sessions were structured in two sections, the first part of the evening was a poster session. Where information gathered for the specific subject was displayed on posters. This gave people attending the event an opportunity to read them and talk to YDRT staff, Addingham Environment Group members and Beck Stewards about the project. The second part of the evening consisted of presentations given by individuals involved in the Addingham 4 becks project and guest speakers.

Water flows and flooding

In April 2019, the first drop-in events was held in Mount Hermon, in Addingham (Page 28). Ten posters were produced to disseminate information gathered from the questionnaire (Task 1, Pages 18 - 27). There was a good turnout to the event and an overall positive response. The residents found the outputs from survey interesting, it sparked plenty of discussion. The event helped to gain more interest in the project, the residents that attended the first event returned to the other drop-in events later in the year. There was also interest from outside Addingham with attendees from Settle. Yorkshire water and Bradford Council were present and gave some interesting presentations and supported the event.

Plants and Wildlife

The second event was held in Addingham at the Memorial Hall, in June 2019 (Page 29). Fifteen posters were produced, these were divided into information about the Beck Stewards, habitats, wildlife along the becks and invasive species (Pages 30 - 44). This event was extremely well attended as it was held on the same evening as the civic society. There were lots of other partners invited to showcase their work which included; The Wild Trout Trust, local anglers and student research about crayfish. At this event we met new residents from the community and had a few more people sign up to be Beck Stewards. Jonny from the Wild Trout Trust gave an excellent talk about brown trout and Charlotte Simons gave a project update.

Figure 3. Barney Learner presenting Bradford Becks work at the third drop-in event, October 2019.

Water Quality

The final drop-in event was held in October 2019 (Page 45), the focus of the event was around water quality. Two posters were displayed (Pages 46 & 49), which included information on Phosphorus and the relationship between phosphorus and population density of freshwater shrimp in town beck. Posters previously printed for other drop in events were displayed at the final drop-in event, with particular focus on the Beck Stewards and the wildlife in Addingham. At the event there were two other displays from Ilkley clean river group and Bradford becks. This event was well attended (35 people), there was lots of

discussion around water quality and how that impacts communities downstream like Ilkley. We had a guest speaker, Barney Lerner, from the Bradford Becks group, where he gave a fantastic presentation about his experiences with working with the local community in Bradford (Figure 3).

Gathering and generating information

Task 5. Develop the Beck Steward programme already in place by providing training in mapping surface water drains, inflows, culverts and weirs, measuring flow, identifying invasive species, identifying aquatic plants and animals and recording results on spreadsheets.

Figure 4. Picture of beck side plant training, July 2019

Figure 5. Picture of brown trout training, August 2019

Beck side plant identification training

In July 2019, Nicky Vernon gave a fantastic guided walk along Town Beck where she picked out key beck side plants and helped Beck Stewards identify them (Figure 4). These have been included in the survey forms and Beck Stewards are now able to record any key plant species.

Trout training

Professor Jonny Grey, from the Wild Trout Trust and Dr Marie Taylor, ran a training event on brown trout (Figure 5). They surveyed Town Beck and were able to show the Beck Stewards what the brown trout in their becks looked like and some key information about habitat and issues on the beck.

Inflow and structures survey training

Conor Scholey ran the inflow and structures training with the Beck Stewards in September 2019. Beck Stewards were given the inflows and structures survey form and they tried it out on a section of Town Beck. Since the training they have recorded data which has now been mapped (See Task 6).

All the survey forms and training information has been put into a beck steward handbook. This is an additional output that has been produced during the project. The handbook includes; project background, identification information, annual task planner and health and safety details (Pages 48 – 77). This is a useful tool for the Beck Stewards to refer to and for new Beck Stewards to use and give them guidance and useful reference material.

Task 6. Carry out surveys of the project area and generate data on rainfall-flow relationships by measuring rainfall (using a standard rain gauge at the top of the catchment), mapping all water sources, springs, storm drains and flow-paths and installing a new beck-level recording station on Lumb Ghyll Beck for comparison with the existing recorder on Town Beck. Landowner's permission to install a new beck level recording station has already been obtained.

Several surveys have been facilitated through training and the distribution of survey forms to the Beck Stewards. Surveys to record the number of structures along the becks, including pipes, culverts, weirs and natural flow-paths, have been conducted by the Beck Stewards and the results then mapped using 10 figure GPS values (Figure 6). The mapping section of this task is still ongoing, with more features mapped as and when the survey forms are returned.

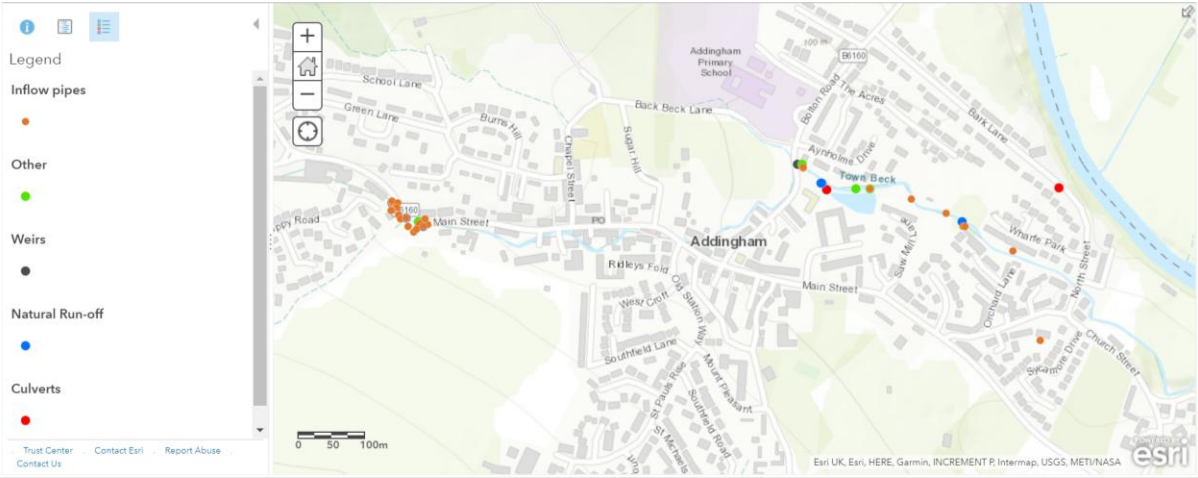


Figure 6. GIS map showing the location of structures and natural run-off flow paths along Town Beck.

The level recorder that has been placed on Lumb Beck has provided useful comparison data between the response of the agricultural and urban catchments of Addingham (**Error! Reference source not found.**). Both level recorders are being used to create a background dataset of beck levels in Addingham and to look at the response of each catchment during rainfall events.

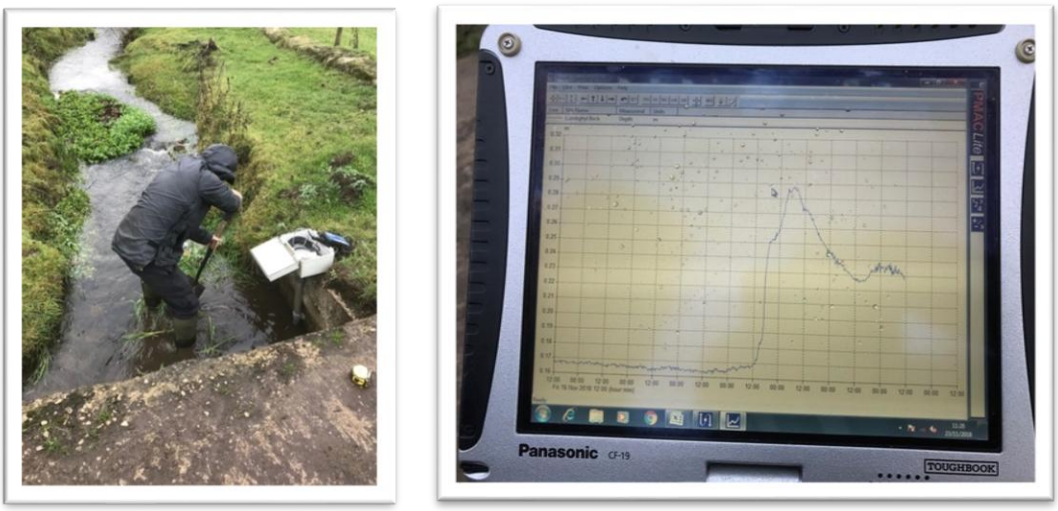


Figure 7. Level recording logger installed on Lumb Beck.

When comparing the results from the level recorders, it appears that there were more peaks on Town Beck than on Lumb Beck (Figure 8). This is likely due to Town Beck being the urban catchment with greater areas of impermeable surface and thus making the hydrograph flashier than that of Lumb Beck. Town Beck is also more responsive to smaller rainfall events. The response of the two catchments to rainfall events varies also with Lumb Beck level rising later and falling more slowly (Figure 9). Again, this is as expected when comparing the hydrograph of an urban and agricultural catchment for the same rainfall event.

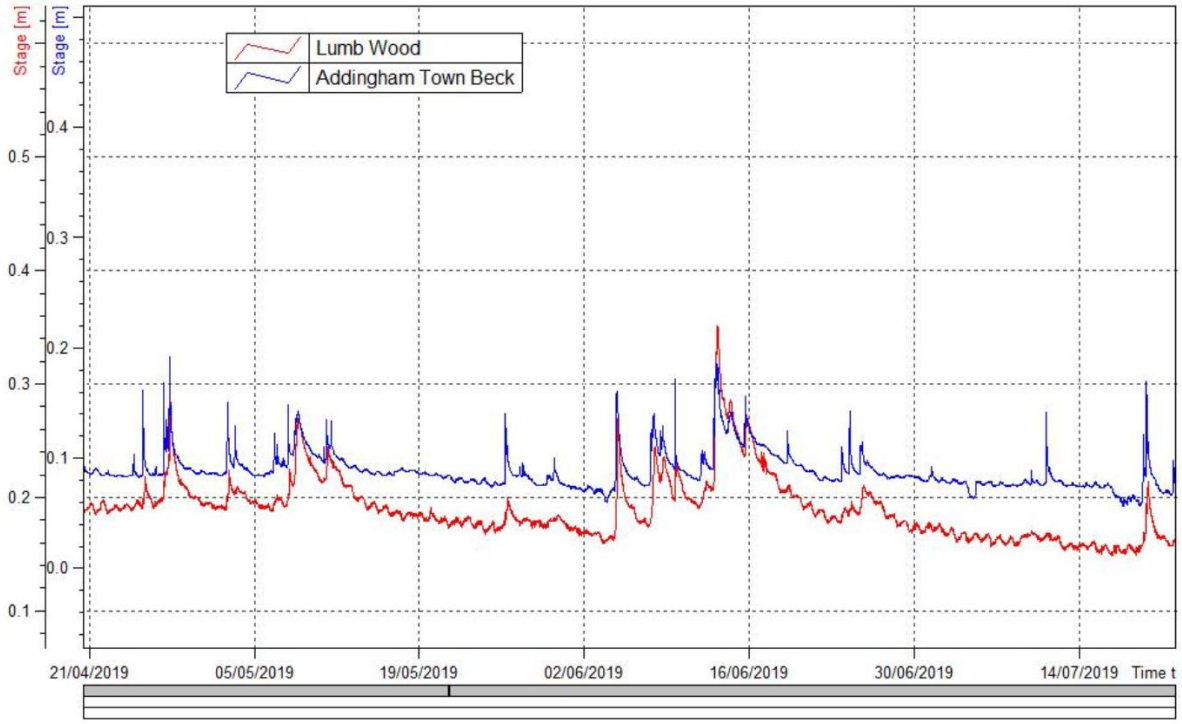


Figure 8. Water level data (m) from Town Beck and Lumb Beck level recorders between April and July 2019. Red circles indicate the difference in frequency and peak height of water level between the two becks.

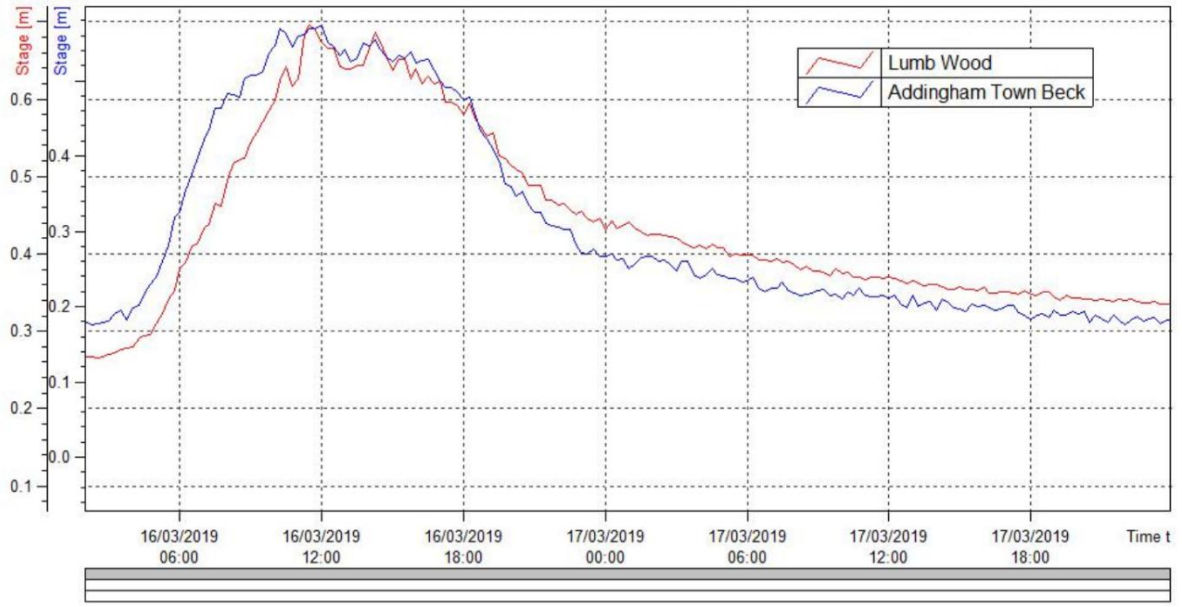


Figure 9. Comparative hydrographs for the Town Beck and Lumb Beck level recorders (m) during a single rainfall event March 2019.

Task 7. Assess water quantity – water quality relationships by sampling all four becks and surface water drains at different water levels for soluble reactive phosphate (SRP), total phosphorus (TP), nitrate, turbidity and biochemical oxygen demand (BOD)), with samples analysed by the EA laboratory in Exeter.

With the help of the Beck Stewards water quality and kick samples were collected to assess the water quality of the four becks surrounding Addingham. The data was collected as a snapshot of the becks in January 2019, with several spots along each beck being used as sampling points to give a story of the water quality of the beck moving downstream (Figure 10). On Town Beck in particular, samples were taken from certain inflows to the beck such as the pipe draining surface run-off from the Big Meadow Drive estate into the beck. This was done to show the impact of the inflows on the water quality of Town Beck. This was compared to the Water framework Directive (Figure 11), and samples (TB9- TB18) downstream of Big Meadow Drive estate were classified as moderate, and those upstream were classified as good. Water quality results were compared to the freshwater shrimp (*Gammarus pulex*) populations, and there was a clear relationship between the decline in water quality numbers of Freshwater shrimp (Figure 12). All samples were sent to the EA laboratory in Exeter and these values were used to analyse the data, which featured heavily at the Water Quality Drop-In session.

Figure 10. Map representing the orthophosphate concentration (µg/L) of main channel samples (green) and inflows (orange).

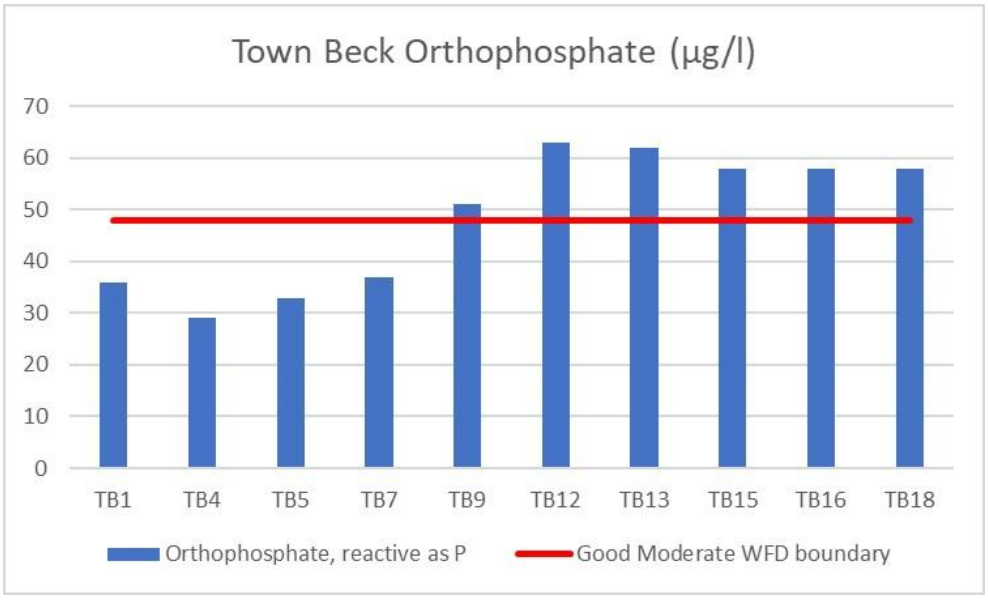


Figure 11. Graph showing the Town Beck sampling points against the orthophosphate concentration for the instream samples. The Good-Moderate WFD boundary uses the upland, high alkalinity value to show which samples fail for orthophosphate.

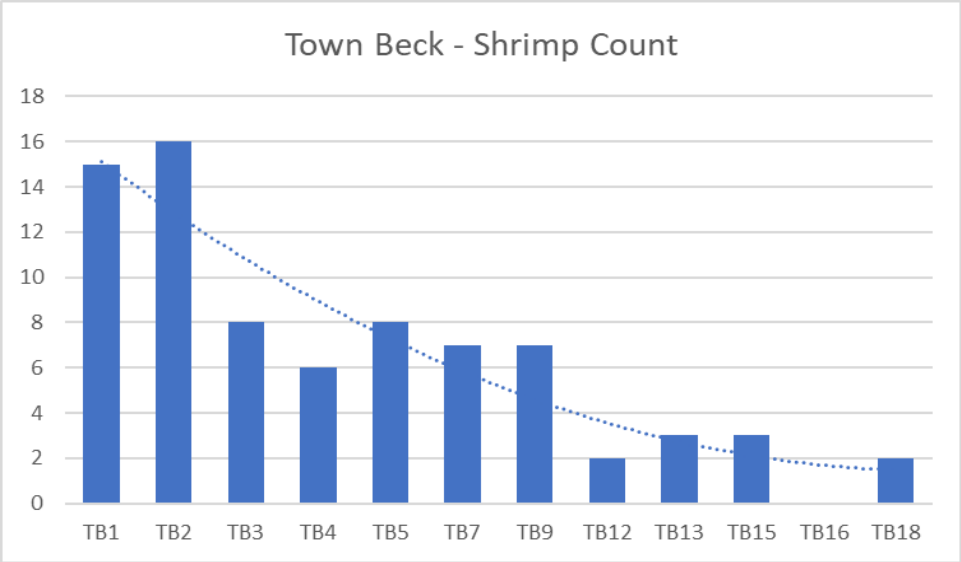
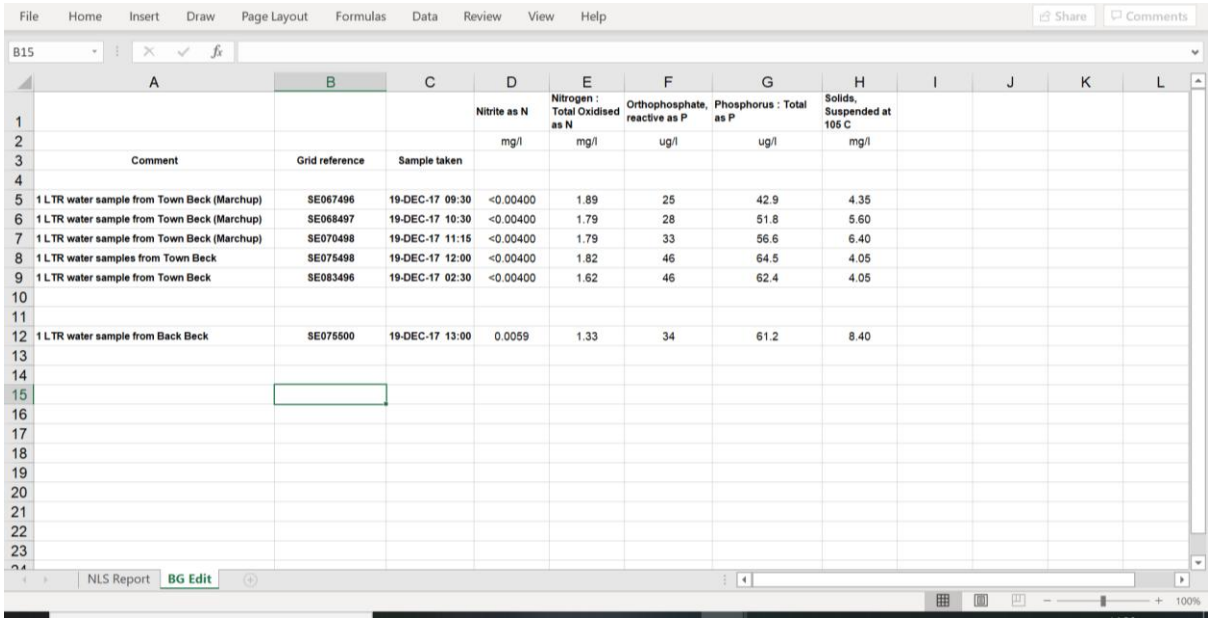


Figure 12. Graph showing the decline of Freshwater Shrimp (*Gammarus pulex)* moving downstream along Town Beck, from data collected in January 2019 kick samples.

A smaller dataset of points along Town Beck and Back Beck, which have been sent to and analysed by the EA laboratory in Exeter, are also being used to compare with the January 2019 dataset. The sample sites from the previous data have been kept consistent with new sites added to the project (36 sample sites across the 4 becks) (Figure 13).

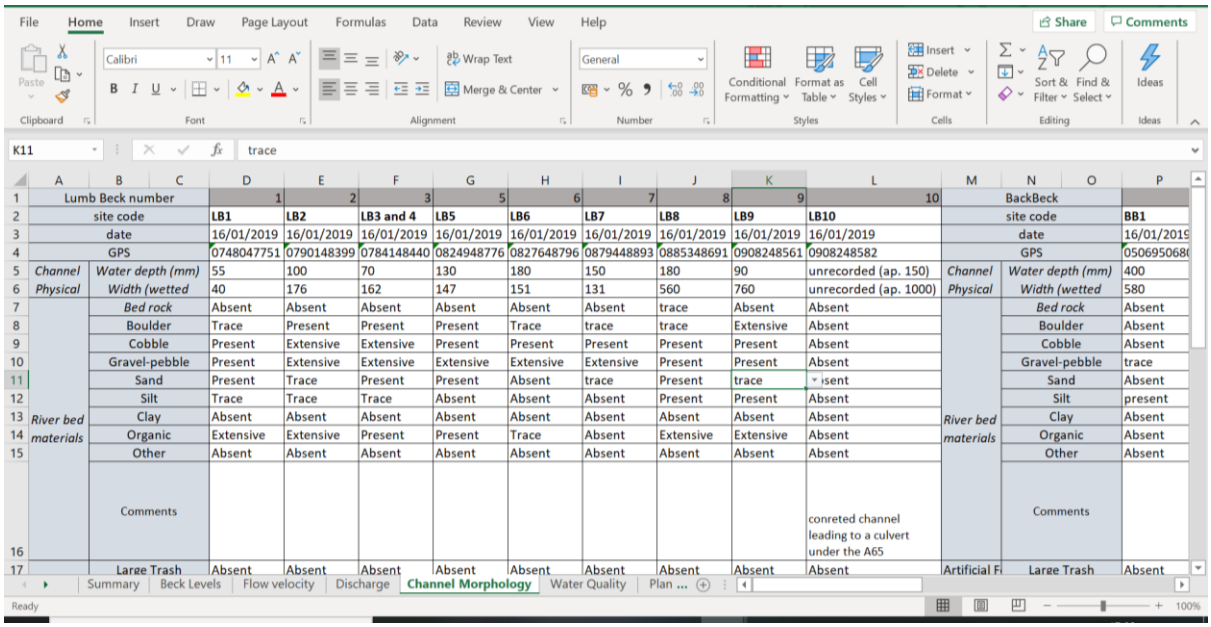


	A	B	C	D	E	F	G	H
1				Nitrite as N	Nitrogen : Total Oxidised as N	Orthophosphate, reactive as P	Phosphorus : Total as P	Solids, Suspended at 105 C
2				mg/l	mg/l	ug/l	ug/l	mg/l
3	Comment	Grid reference	Sample taken					
4								
5	1 LTR water sample from Town Beck (Marchup)	SE067496	19-DEC-17 09:30	<0.00400	1.89	25	42.9	4.35
6	1 LTR water sample from Town Beck (Marchup)	SE068497	19-DEC-17 10:30	<0.00400	1.79	28	51.8	5.60
7	1 LTR water sample from Town Beck (Marchup)	SE070498	19-DEC-17 11:15	<0.00400	1.79	33	56.6	6.40
8	1 LTR water samples from Town Beck	SE075498	19-DEC-17 12:00	<0.00400	1.82	46	64.5	4.05
9	1 LTR water sample from Town Beck	SE083496	19-DEC-17 02:30	<0.00400	1.62	46	62.4	4.05
10								
11								
12	1 LTR water sample from Back Beck	SE075500	19-DEC-17 13:00	0.0059	1.33	34	61.2	8.40

Figure 13. Water quality dataset, received from the EA lab in Exeter, from December 2017.

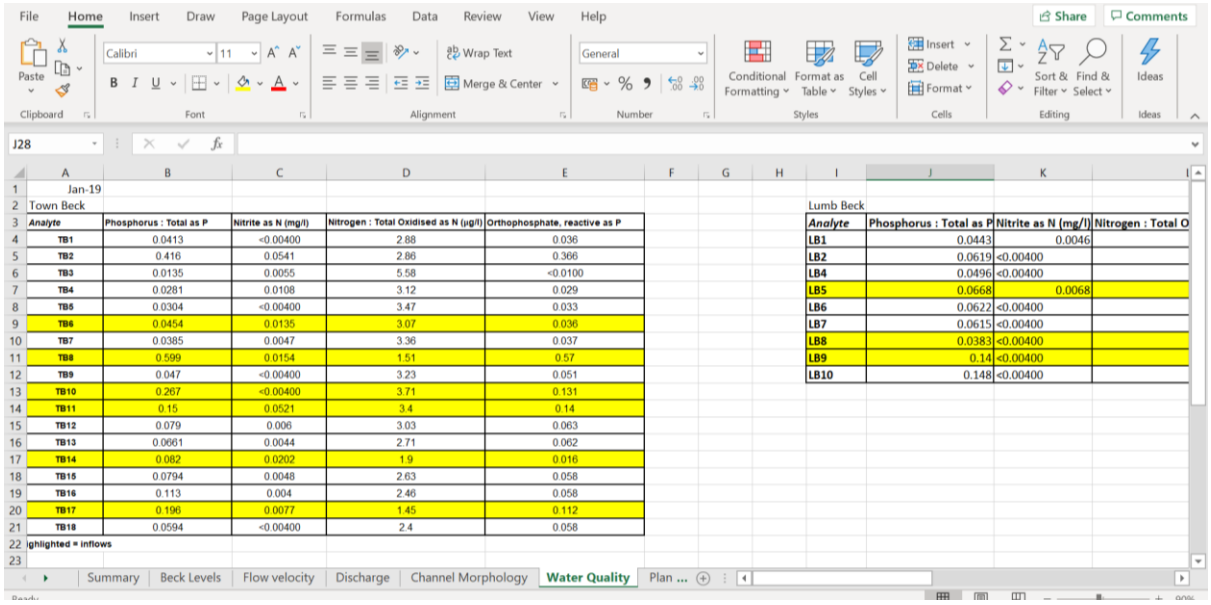
Task 8. Set up a database to store all data on beck levels, flow velocity and discharge, water quality (determinands as above Task 3), plant and animal populations and historical records.

A database to store information relating to the outcomes of the project has been developed, holding data collected through various Beck Steward activities (Figure 14 & Figure 15). Data collection is ongoing and therefore the database is continually being added to as data becomes available. The database will also hold the data presentation created through analysis and as part of events such as the Water Quality Drop-in event. The database will be linked to the GIS mapping of the project and will have the capacity to grow as more sampling is done on the 4 becks.



1	Lumb Beck number		1	2	3	5	6	7	8	9	10	BackBeck		
2	site code		LB1	LB2	LB3 and 4	LB5	LB6	LB7	LB8	LB9	LB10	site code		BB1
3	date		16/01/2019	16/01/2019	16/01/2019	16/01/2019	16/01/2019	16/01/2019	16/01/2019	16/01/2019	16/01/2019	date		16/01/2019
4	GPS		0748047751	0790148399	0784148440	0824948776	0827648796	0879448893	0885348691	0908248561	0908248582	GPS		0506950680
5	Channel	Water depth (mm)	55	100	70	130	180	150	180	90	unrecorded (ap. 150)	Channel	Water depth (mm)	400
6	Physical	Width (wetted	40	176	162	147	151	131	560	760	unrecorded (ap. 1000)	Physical	Width (wetted	580
7		Bed rock	Absent	Absent	Absent	Absent	Absent	Absent	trace	Absent	Absent		Bed rock	Absent
8		Boulder	Trace	Present	Present	Present	Trace	trace	trace	Extensive	Absent		Boulder	Absent
9		Cobble	Present	Extensive	Extensive	Present	Present	Present	Present	Present	Absent		Cobble	Absent
10		Gravel-pebble	Present	Extensive	Extensive	Extensive	Extensive	Extensive	Present	Present	Absent		Gravel-pebble	trace
11		Sand	Present	Trace	Present	Present	Absent	trace	Present	trace	isent		Sand	Absent
12		Silt	Trace	Trace	Trace	Absent	Absent	Absent	Present	Present	Absent		Silt	present
13	River bed	Clay	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	River bed	Clay	Absent
14	materials	Organic	Extensive	Extensive	Present	Present	Trace	Absent	Extensive	Extensive	Absent	materials	Organic	Absent
15		Other	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent		Other	Absent
16		Comments									conreted channel leading to a culvert under the A65		Comments	
17		Large Trash	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Artificial Fi	Large Trash	Absent

Figure 14. The database is currently held on Excel as shown above and has a tab for each of the areas of data collection.



	A	B	C	D	E
1	Jan-19				
2	Town Beck				
3	Analyte	Phosphorus : Total as P	Nitrite as N (mg/l)	Nitrogen : Total Oxidised as N (µg/l)	Orthophosphate, reactive as P
4	TB1	0.0413	<0.00400	2.88	0.036
5	TB2	0.416	0.0541	2.86	0.366
6	TB3	0.0135	0.0055	5.58	<0.0100
7	TB4	0.0281	0.0108	3.12	0.029
8	TB5	0.0304	<0.00400	3.47	0.033
9	TB6	0.0454	0.0135	3.07	0.036
10	TB7	0.0385	0.0047	3.36	0.037
11	TB8	0.599	0.0154	1.51	0.57
12	TB9	0.047	<0.00400	3.23	0.051
13	TB10	0.267	<0.00400	3.71	0.131
14	TB11	0.15	0.0521	3.4	0.14
15	TB12	0.079	0.006	3.03	0.063
16	TB13	0.0661	0.0044	2.71	0.062
17	TB14	0.082	0.0202	1.9	0.016
18	TB15	0.0794	0.0048	2.63	0.058
19	TB16	0.113	0.004	2.46	0.058
20	TB17	0.196	0.0077	1.45	0.112
21	TB18	0.0594	<0.00400	2.4	0.058
22	ghlighted = inflows				
23					

	I	J	K	L
	Lumb Beck			
	Analyte	Phosphorus : Total as P	Nitrite as N (mg/l)	Nitrogen : Total O
	LB1	0.0443	0.0046	
	LB2	0.0619	<0.00400	
	LB4	0.0496	<0.00400	
	LB5	0.0668	0.0068	
	LB6	0.0622	<0.00400	
	LB7	0.0615	<0.00400	
	LB8	0.0383	<0.00400	
	LB9	0.14	<0.00400	
	LB10	0.148	<0.00400	

Figure 15. Water Quality data, from the January 2019 data collection, in the Addingham database.

Task 9. Develop a GIS for mapping the catchments of all four becks adding layers for water flow, channel morphology, water quality, invasive species, vegetation and land-use, land ownership etc.

GIS has been used to map various features during the project from the different aspects of the water quality data to create maps such as those for Task 6 (Figure 10). Maps have also been created showing land ownership (Figure 16), which is being used to identify farmers who we may wish to work with for developing the NFM aspect of the project in Phase 2.

Figure 16. The land ownership layer of the GIS developed for the whole of Addingham. Fill colour represents the farmer and the outline is the landowner where the farmer is not the landowner.

Layers on the GIS are being developed as walkovers identifying vegetation, invasive species and wildlife are continuing to be conducted by the Beck Stewards. As the data is collected and made available it will continually be added to the GIS to create a complete view of variables surrounding the Addingham 4 Becks project.

Task 10. Build a 4Becks Project web-page to provide up-to-date information on all activities and to hold documents (maps, report, walks) for downloading, hosted on the AEG website.

An Addingham 4 Becks project webpage is hosted on the YDRT website. The webpage has sections to detail aspects of the project including the water quality data analysis and a documents section which will hold the report alongside other documents of significance to the project.

The webpage has sections related to the outcomes of the project (SuDS, water quality, walking routes and flood resilience) and holds links to documents of relevance to the project that can be shared publicly. The guided walking routes, water quality posters and SuDS leaflet are present on the webpage. The webpage is an ongoing outcome of the project with documents and more information being added as they are produced during the project.

Task 11. Generate a report including a description of the work undertaken along with summary maps of the beck system, water quality, land-use etc. .

This report is the output for this task.

Task 12. Design and make available (hard copy and electronic copy) one or more village beck walks linking together points of interest along the becks backed up by more detailed information on the website.

Three walking routes have been created to allow walkers to see the catchments of Town Beck, Back Beck and Lumb Beck. Within each walk there are several options depending on the length of the walk and what features may be of interest to a walker. Points of interest are included along the routes which allow for walkers to see areas that relate to the project or have significance to another extent. At current the walks are available as an electronic copy on the Addingham 4 Becks webpage which is hosted on the YDRT website. For the hard copy's enquiries have been made to get a quote for the price of having an A5 leaflet designed professionally for each walking route. These leaflets would be distributed in Addingham and used in conjunction with a walking route launch as part of Phase 2.

Task 13. Raise awareness about SuDS across the village by demonstrating the YDRT's SuDS house at the Environment Day, producing a leaflet that describes what can be done to slow or prevent surface water from paved areas entering the becks and recruiting volunteer householders to host demonstration systems.

The SuDS house was taken to two Environment Days one in 2018 and the other in 2019, there was lots of interest around the SuDS house and it was a really useful tool for aiding discussions around flooding (Figure 2). A water friendly homes leaflet was produced to give out to members of the community so they could learn about SuDS and understand what they could be doing to help improve water quality (Page 78). A leaflet was produced to find members of the Addingham community that were happy to install SuDS features around their home and become a demonstration home (Page 79). Beck Stewards hand posted 150 leaflets and targeted the Big Meadow Rise estate. There were several responses following the leaflet drop. These residents were happy to be involved with the project, one resident had already installed a range of SuDS already which makes a perfect demonstration home for SuDS.

Task 14. Assess potential for NFM by catchment walkovers, holding discussions with landowners, mapping potential sites and using hydrological data to model effectiveness.

Discussions have been made with landowners to work with them to deliver NFM, the ones that we spoke to were supportive of the project and open to ideas. Initial walkovers have identified some opportunity (Figure 17) for fencing and planting. This project has enabled us to work with farmers and obtain funding from the Yorkshire Dales Millennium Trust to deliver tree planting, hedge planting and fencing at the top of Lumb Beck in 2020.

Figure 17. Walkover on Marchup Ghyll, looking for NFM opportunities

Task 15. Produce a guide for residents on how to make Addingham more resilient to future flooding, describing the methods residents could use to prevent damage, to raise awareness of the village Emergency Plan, how help can be obtained, where equipment is stored and how it can be accessed.

A draft flood resilience guide detailing what residents of Addingham can do to protect their properties against flooding has been produced and will be available via the webpage to download when finished. The flood resilience guide offers residents potential methods to protect properties in Addingham and encourages them to understand their flood risk. Each method of flood defence is linked to the types of flooding (e.g. surface water run-off, groundwater etc.) and how it will help to alleviate the impacts. The guide also makes residents aware of what is in place in Addingham already including equipment locations and where to access the emergency plan.
Addingham's village emergency plan was discussed at the public drop-in event on flooding as part of Task 4. As part of this drop-in event, posters using responses from the questionnaires were displayed which showed that 77% of people in Addingham did not know about the emergency plan. Highlighting the need for future works to raise awareness of flood risk and of the options available to residents when tackling these risks.

Summary

The funding from this project has been hugely important in several different ways:

- supporting the Addingham Environment Group,
- bringing partners and communities together,
- helping to raise the profile of the Addingham 4 becks,
- increasing awareness and knowledge of; flooding, wildlife & water quality within the community,
- training and upskilling volunteers,
- provide a template for working with communities, that can be rolled out to other beck catchments along the River Wharfe,
- building links with landowners
- enabling landowners to obtaining funding for tree planting,
- and has led us to develop a phase two for the project.

Phase Two Planning

- Mapping Moor Park and Coppy Beck
- Match up surface water drains with mapped pipes and assess the flow and water quality from pipes entering the becks.
- Walking launch event with official walking leaflet and installation of way markers
- Add to and make hard copy version of Beck Steward handbook, included frequently asked questions.
- Cost up SuDs for demonstration houses
- Develop a cost-effective DIY SuDs kit and provide training to local residents
- Work with iCASP to explore use of SD TOPMODEL to the Marchup/Town Beck and Back Beck catchments to identify optimum NFM strategy
- Carry out NFM farm plans and cost up options for delivery
- Further investigate Big Meadow drive outfall pipe
- Support Beck Stewards and collect walkover survey information and continue to map data
- Hydrology and rainfall data analysis

        - look at water level, turbidity, nutrient relationship by installing a turbidity logger on Town Beck.
        - Beck stewards collect data using flow sensors (Mainstream Measurements) to measure discharge in Town Beck.
    - Attend quarterly beck steward meetings
    - Three drop in events (NFM, SuDS and Beck Stewards?)

Acknowledgements and Contributions

The project would have not been possible without the help and support of:

- Addingham Environment Group
- Addingham Civic Society
- Bradford Council
- Environment Agency
- Wild Trout Trust
- Yorkshire Water

The beck stewards have been a huge part of this project, their time and contribution has been outstanding. It has been estimated that 700 hours of volunteer time has been contributed since July 2018. This is the equivalent of 93 days, which is the equivalent of over £4.5k of in-kind match contribution to the project.

Appendix

Appendix 1. A blank copy of the questionnaire produced for Task 1.

Addingham Environment Group 4Becks Project

Flooding Questionnaire

On Boxing Day 2015 we experienced the worst floods in living memory. To help prepare for future flooding we are carrying out a study of the 2015 and earlier floods in the village. We would very much appreciate your help by filling out this questionnaire. The information you give us is strictly for the purposes of this study and will be treated confidentially. Thank you!

Please continue your answers on a separate sheet if you need more space.

1. Where in the village did you see flood-waters on Boxing Day 2015 (please describe and/or mark up on the map)?
   ……
2. Can you provide any photographs? **Yes/No**. If **yes** please send to aeg@addingham.info .
3. Did your property (house/garden) suffer from flooding on Boxing Day 2015? **Yes/No**
4. It would be very helpful if you can provide the address of the property concerned:
5. Can you briefly describe what happened?
   ……
6. How high did the water reach e.g. depth in basement, proximity to front or back door?
   ……
7. Where did the water come from? From becks overtopping their banks? From water rising up through the ground? From water flowing down a hillslope or road? Or a combination? (Please mark using arrows on the attached map if appropriate)
   ……
   Have you experienced flooding previously? **Yes/No** If **yes**, how frequently and to what extent?
   ……
8. Did you receive any warning about the risk of flooding on Boxing Day or any other occasion? **Yes/No** If **yes**, how and from whom? ……

9. Have you taken measures to reduce the chance of being flooded in future? E.G. Flood guard(s), sand bags, basement pumps etc. **Yes/No.** If **yes**, please give details

   ……

10. Are you planning to do anything to reduce risk in the future? **Yes/No.** If **yes,** please give details

    ……..

11. Are you aware of the village's Community Emergency and Flood Plan? **Yes/No**

12. Do you know who to contact in the event of a flood? **Yes/No**

13. Have you signed up to the Environment Agency Flood Warning Service? **Yes/No**

14. What more could be done to help, and by whom?

    ……

15. Do you think flood risk is increasing? **Yes/No**. If **yes**, why? ……
16. What measures do you think are the most important to take to reduce flood risk or flood severity?

    ……

Thank you again

If you are willing to be contacted for further information please provide your contact details:

Name:…… ……
Telephone:…….
Email address: … ……..

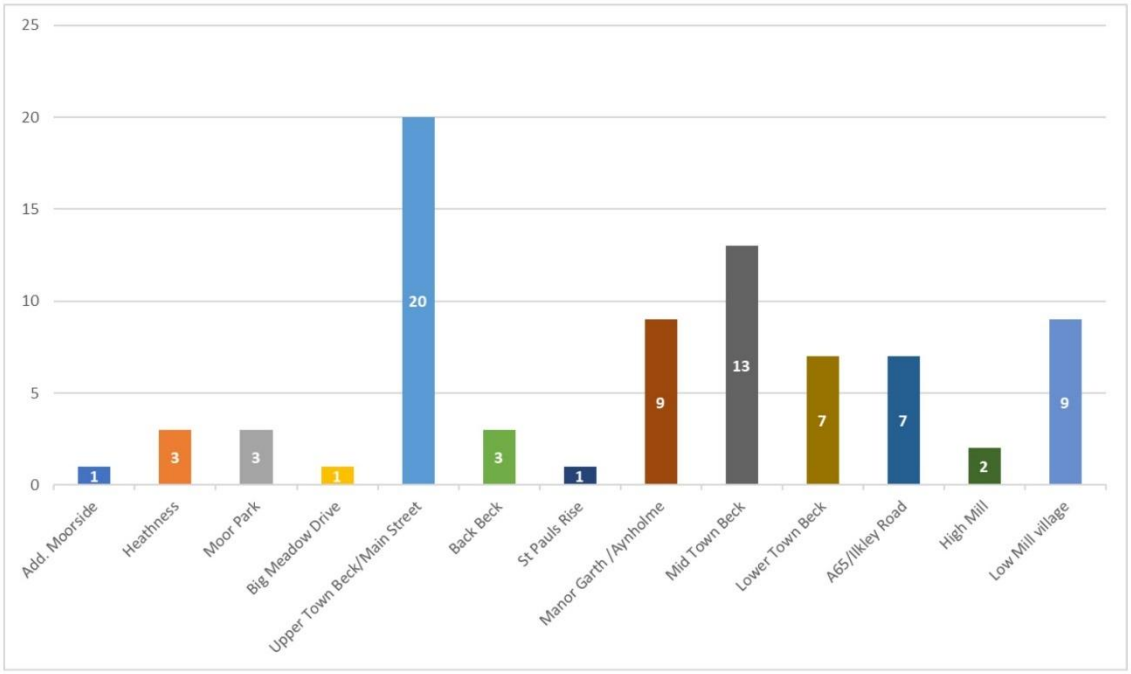
Please put this questionnaire after completion into the box on the 4Becks stand or post or hand deliver to 9 Main St., Addingham, LS29 0PD.

For more information about the 4Becks Project please email aeg@addingham.info

Appendix 2. Ten posters produced to disseminate information gathered from the flood questionnaires (Task 1), these were also displayed at the first drop in event (Task 4).

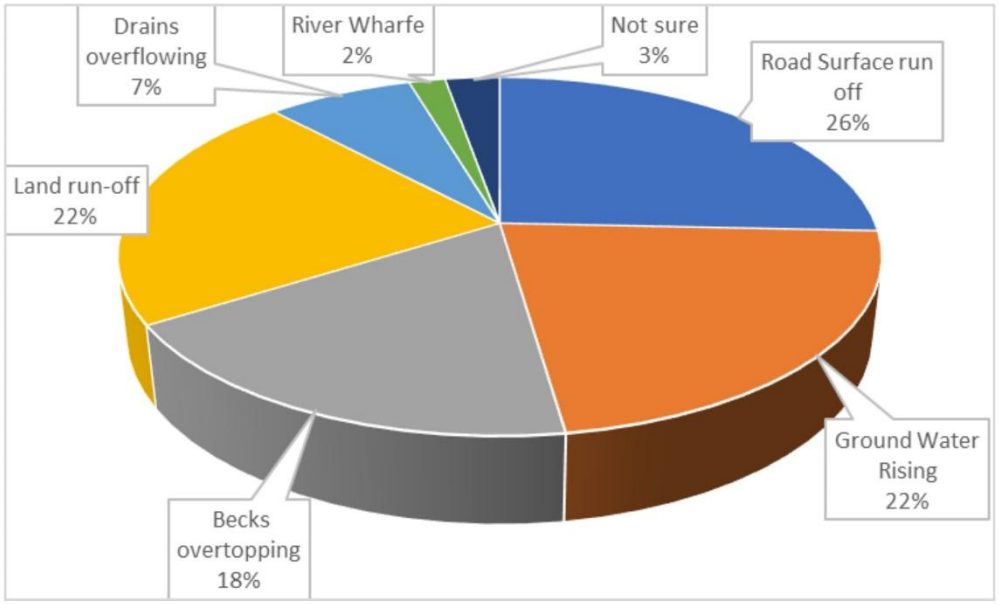
ADDINGHAM BECKS

Where in the Village did you see Flood waters on Boxing Day 2015?



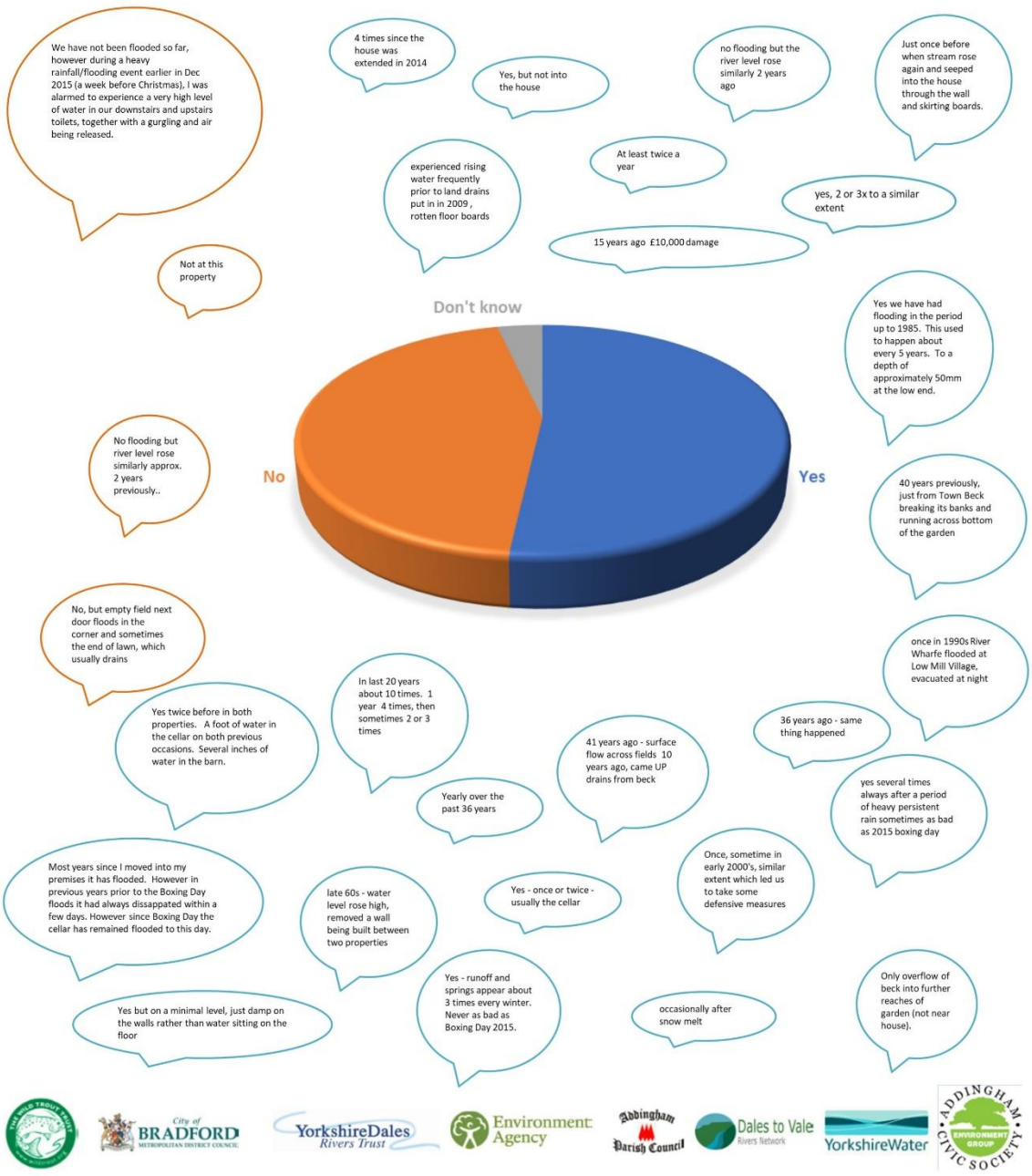
Zone	Name	Description
1	Addingham Moorside	Farmland and moor to the south of the A65
2	Heathness	Skipton Road from A65 down to the junction with Main Street
3	Moor Park	between Moor Lane and Silsden Road
4	Big Meadow Drive	housing areas off Big Meadow Drive
5	Main Street/Upper Town Beck	Town Head to Bolton Road (Crown)
6	Back Beck	streets south of Back Beck (School Lane, Burns Hill, Sugar hill)
7	St Pauls Rise	Old Station Way, St Pauls Rise, Southfield Terrace
8	Manor Garth /Aynholme	Bolton Road, Aynholme bridge
9	Mid Town Beck	The Acres, Wharfe Park, Side Beck, Saw Mill, Orchard Lane
10	Lower Town Beck	Church Street, North Street, Church Field, Low Mill Lane
11	A65/Ilkley Road	Lower Main Street, A65 turn off, Ilkley Road
12	High Mill	High Mill by Wharfe
13	Low Mill Village	Old Lane, Mill Fold

Where did the water come from?

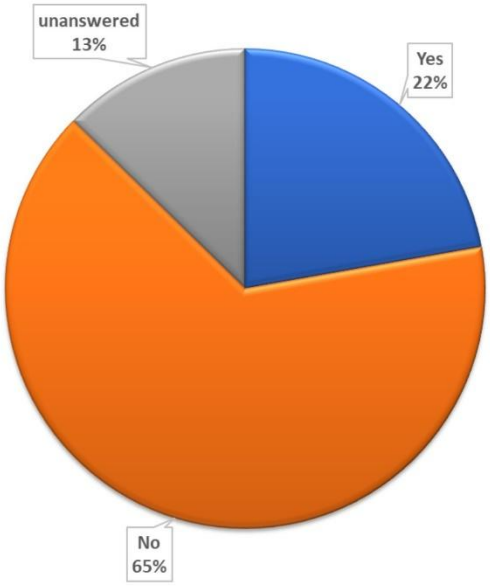


Zone name	Road Surface run off	Ground Water Rising	Becks overtop-ping	Land run-off	Drains overflow-ing	River Wharfe	Not sure
Addingham Moorside	1			1			
Heathness	1	1		3			
Moor Park	1		1	2	1		
Big Meadow Drive	0	2	0	2	0	0	0
Main Street/Upper Town Beck	9	11	7	5	3	0	1
Back Beck	2	1	2	0	0	0	0
St Pauls Rise				1			
Manor Garth /Aynholme	4	0	3	0	1	0	0
Mid Town Beck	6	4	4	7	3	0	0
Lower Town Beck	0	2	1	1	0	0	1
A65/Ilkley Road	3	1		2			1
High Mill		2					
Low Mill Village	1		2			2	
Total	28	24	20	24	8	2	3

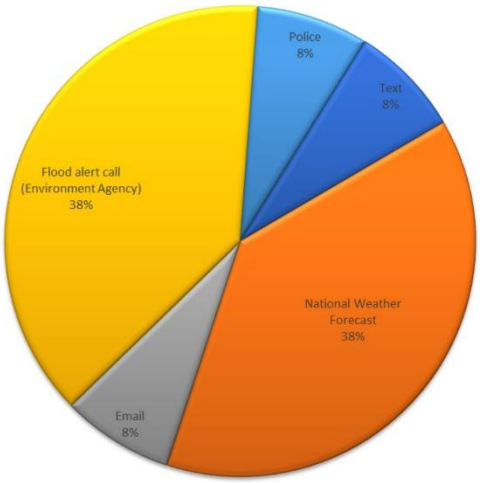
Have you experienced flooding previously? How frequently and to what extent?



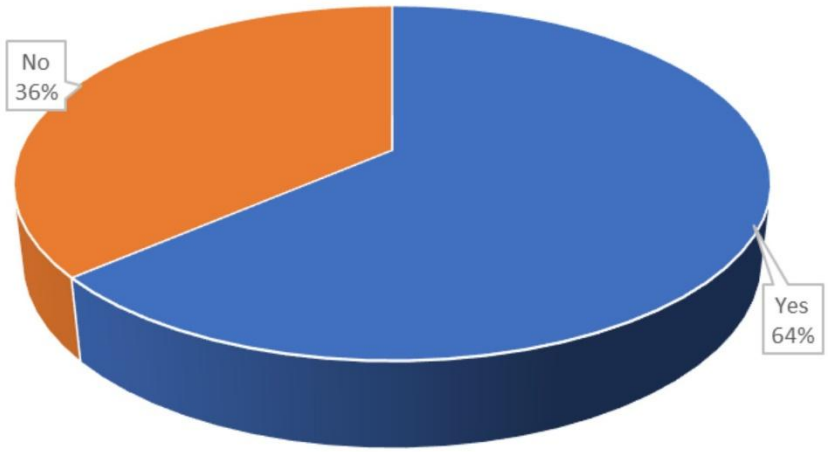
Did you receive any warning about the risk of flooding on Boxing Day 2015 or any other occasion?

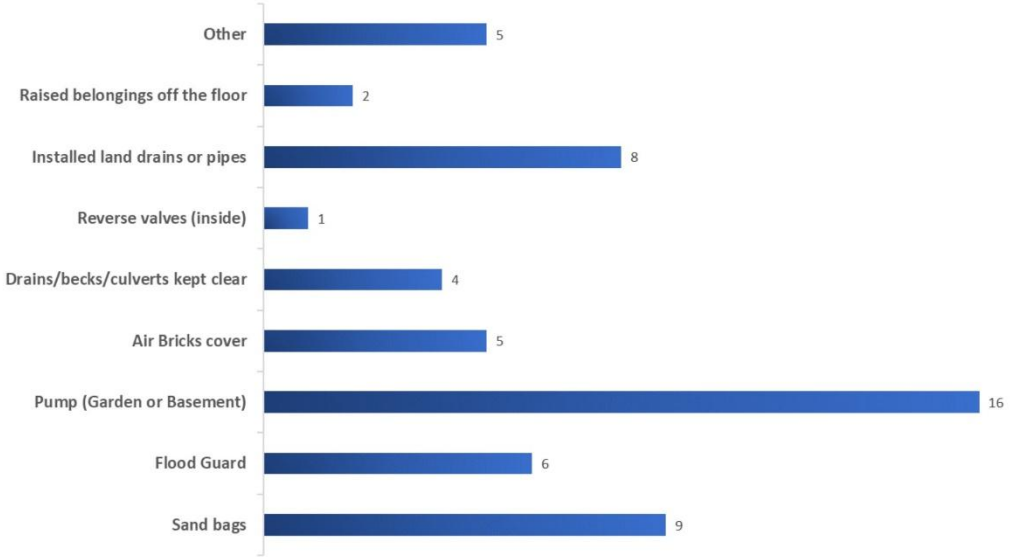


Where did you get this warning from?

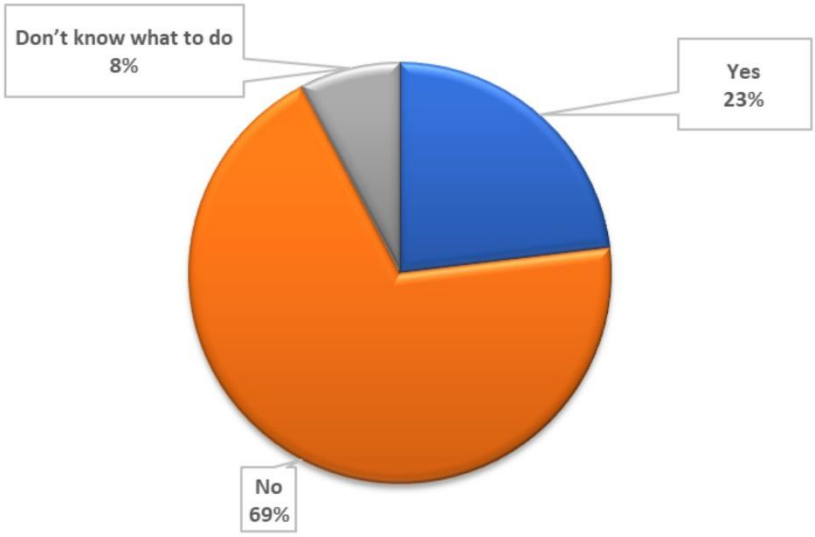


Have you taken any measures to reduce the chance of being flooded in the future?





Are you planning to do anything to reduce risk in the future?



Yes, we intend to find out what we might do to reduce risk. We would be interested in knowing where we can find good impartial advice. For instance should we consider fitting covers on our toilets? What are the pros and cons? Are there other measures we should consider?

Contact countryside team after the leaves have fallen

Sandbags

We have cut back the vegetation in the Beck by our house to ensure the water can flow past us without a problem

Neighbours garden drains into our garden - plan to continue to drain this water away from our garden

Better drainage planned to the rear of the property

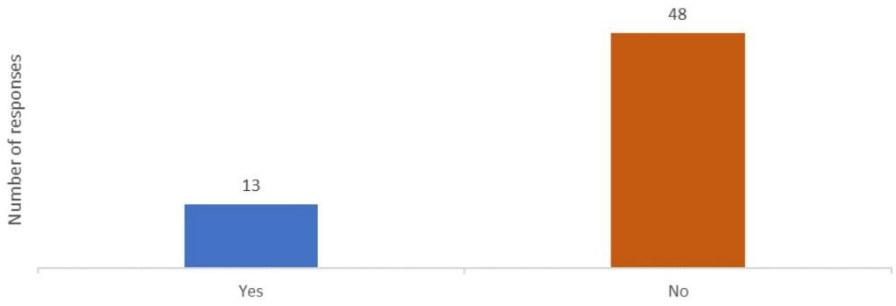
Monitor situation more closely

Increasing wall resistance

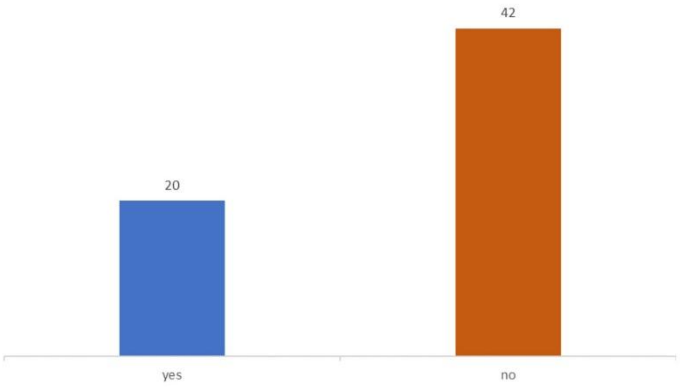
Needs a hole through the front wall to pump water out - no easy solution

Thinking of getting a flood guard

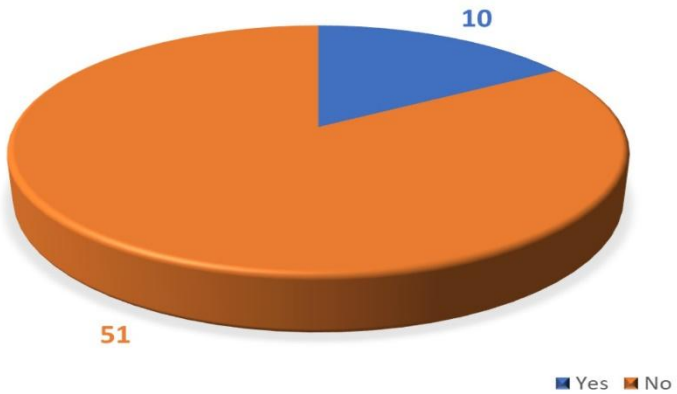
Are you aware of the village's Community Emergency and Flood Plan?



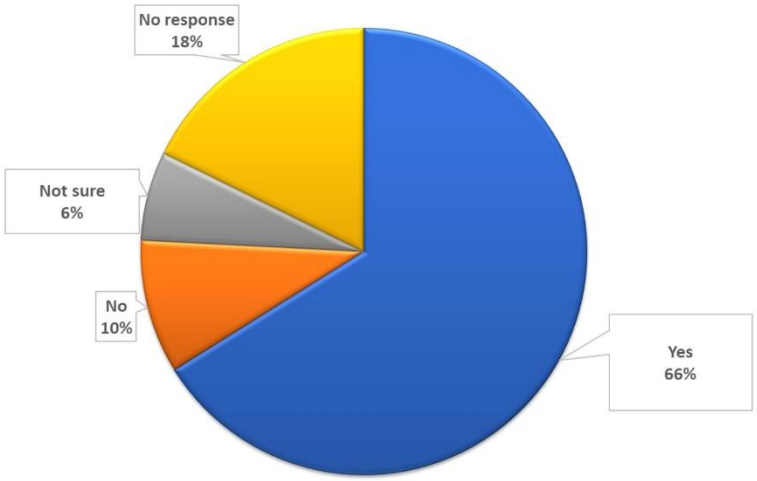
Have you signed up to the Environment Agency Flood Warning Service?



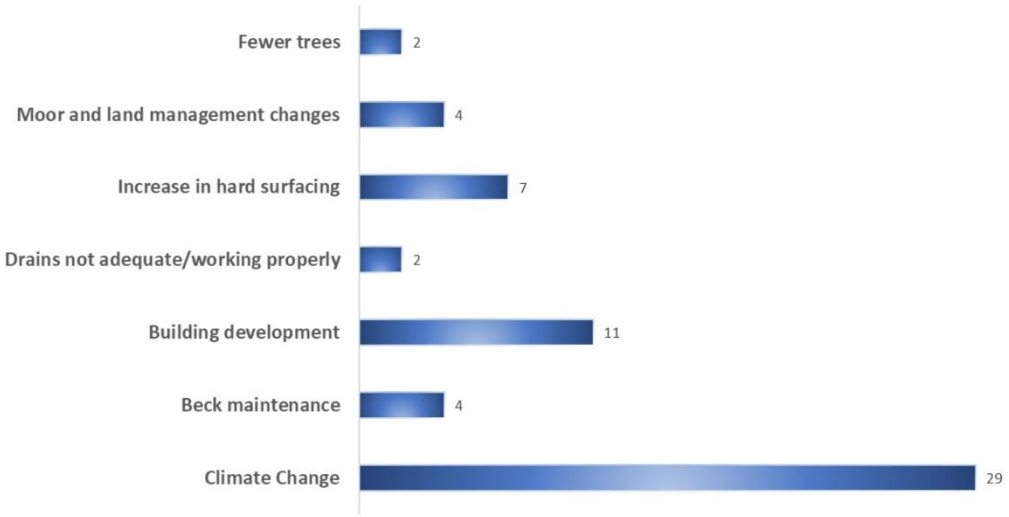
Do you know who to contact in the event of a flood?



Do you think flood risk is increasing?

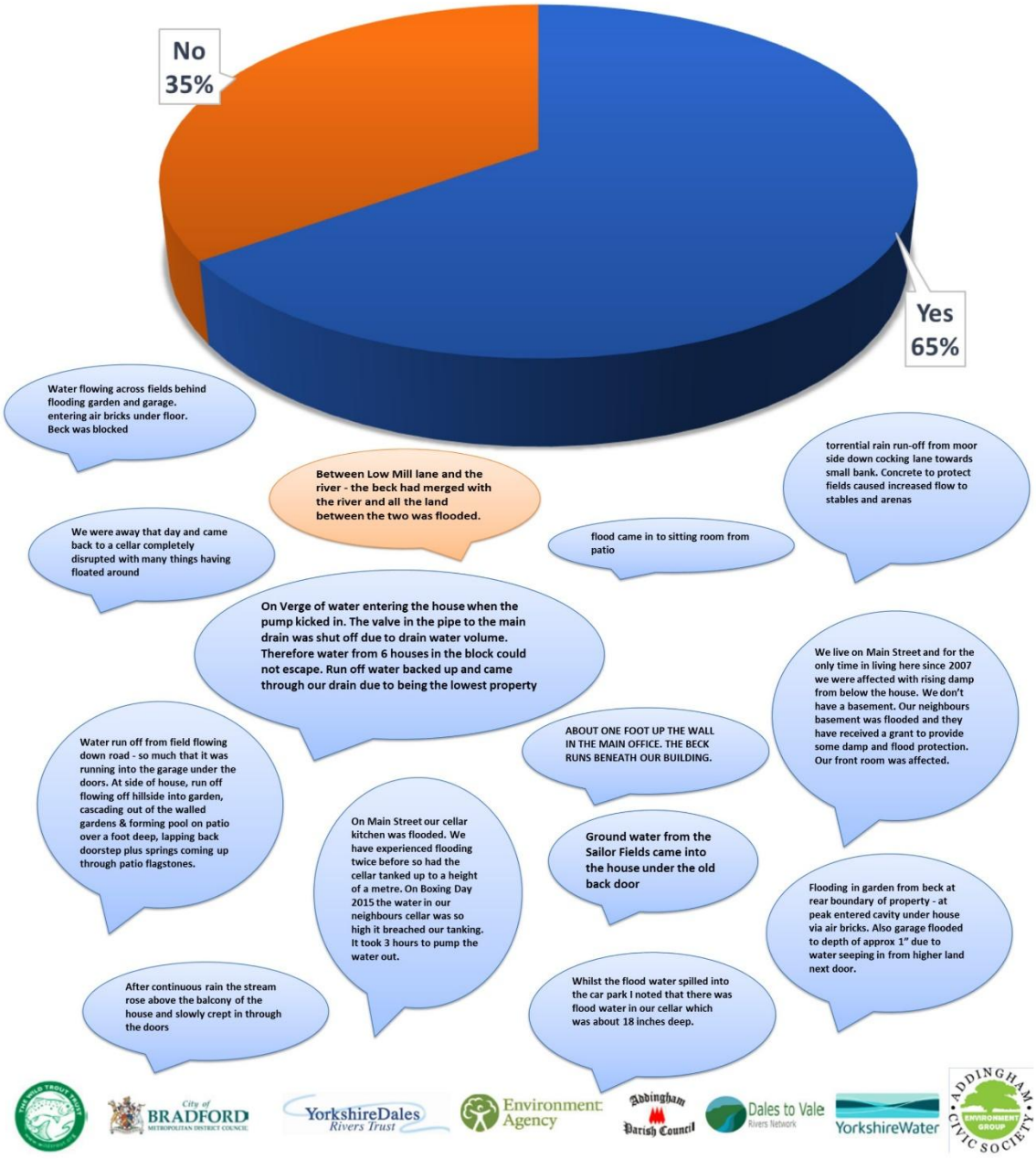


Why?

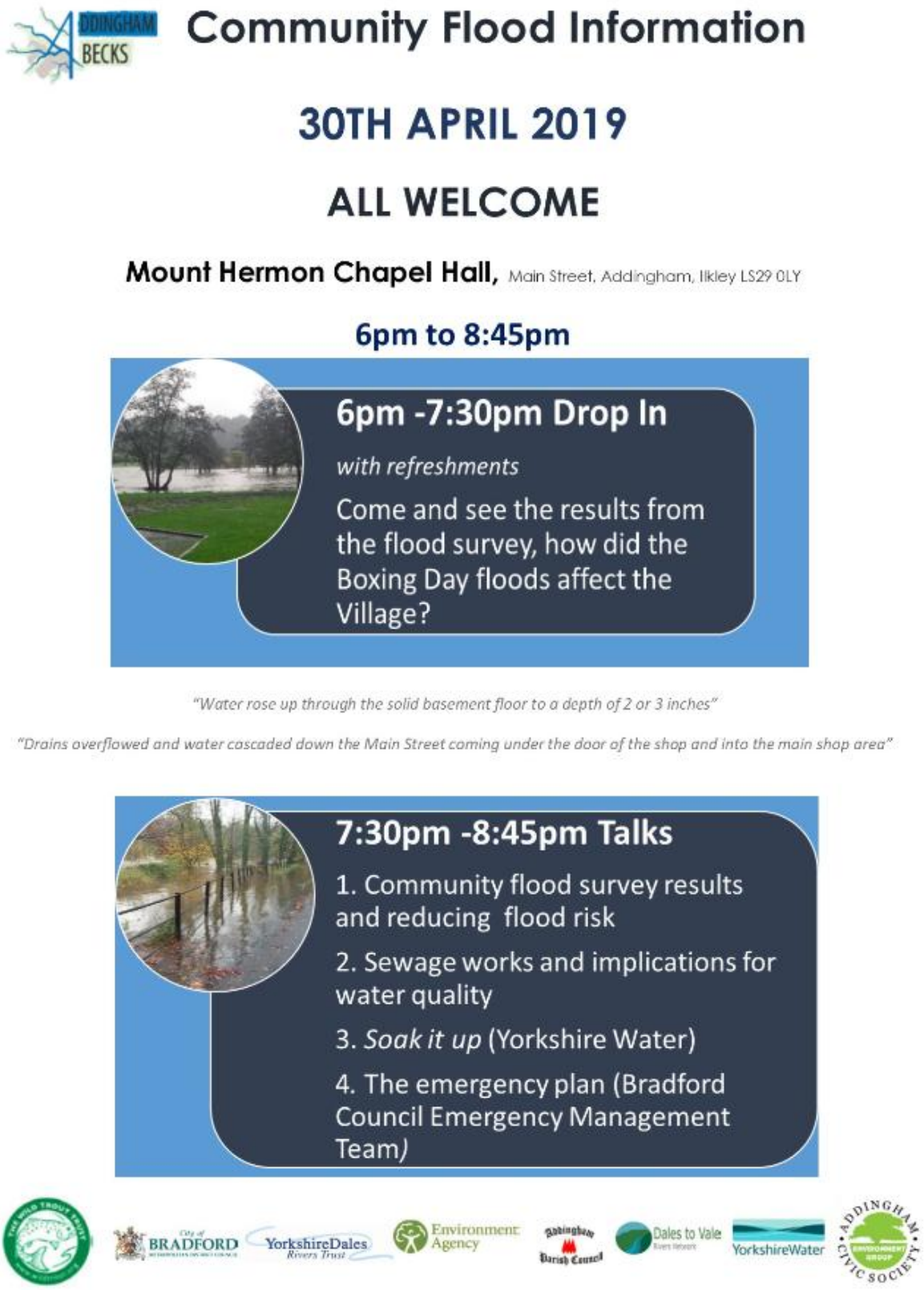


What happened?

Did your property flood on Boxing Day 2015?



Appendix 3. Poster advertising the first drop-in sessions (Task 4)



Appendix 4. Poster advertising the second drop-in sessions (Task 4)

Appendix 5. Fifteen posters produced to disseminate information gathered about the project, the Beck Stewards and the wildlife in Addingham and invasive species. These were displayed at the second drop in event (Task 4).

Four local becks, rising on the Moors above Addingham help to define Addingham. Today we enjoy them for their presence and the wildlife they contain but in the past they were valued for the energy driving water wheels, allowing Addingham to become a successful centre for making textiles.

Without a function the becks have slipped into the background and have become severely degraded. The population of white clawed crayfish has gone and brown trout are rare.

This project aims to address these issues by:

1. Raising awareness about the value of Addingham's becks
2. Developing a plan to control flooding by slowing the flow of water up-stream
3. Enhancing biodiversity by improving habitat for plants, fish, birds and mammals
4. Reducing nutrient pollution by improving land management

Town Beck - Back Beck - Wine Beck - Lumb Beck

ADDINGHAM BECKS

Being a Beck Steward

We became Beck Stewards because it felt like an interesting use of our time, strolling along collecting litter and enjoying the fresh air and scenery. We were surprised at how much plastic there was alongside and in the water, and the length of time some pieces (especially agricultural bags) had been there.

As we learnt more about the beck stewards' role, and had training in invasive species and water purity (or not), we became more aware of the importance of the becks in relation to the river systems (Wharfe and Ouse) and seas. We now know our work plays a part in protecting the environment as a whole, as well as our village. How cool is that?

We have the privilege and wonder of seeing the flora and fauna of the beck sides at each season (it was special to be shouted at by jays when we accidentally got too near to their nesting area) and of meeting some really helpful residents whose gardens are adjacent to the beck.

All thanks to the environment group.

Maire and Mary

Town Beck - Back Beck - Wine Beck - Lumb Beck.

ADDINGHAM BECKS

Beck Stewards

Who are the beck stewards?

We are a group of local volunteers who live in the village. We all got involved for many different reasons - because

we love the becks, or
we live alongside them, or
we like being outdoors and learning more about our local environment, or
we want to help reduce flooding and pollution and encourage wildlife.

What do the beck stewards do?

We keep an eye on our own allocated stretch of beck: pulling out litter and debris, making a note of interesting plants and wildlife, noticing where drains and pipes come in, keeping an eye on water levels and checking for invasive species such as Himalayan Balsam. We get to know our stretch so that we can notice changes, such as pollution or unusually high water flows.

Do you need to be an expert to be a beck steward?

No! None of us are experts, but we're learning a lot as we go along, and we have opportunities for more in-depth training if we want it.

We've started to learn about beck side plants, sustainable urban drainage systems (SUDs), natural flood measures, riverflies and water quality, and there's plenty more to find out.

Can I be a beck steward?

Yes! You'd be very welcome, and you can get involved as much or as little as you want. You can join one of the becks teams, or just come along and help out from time to time on any of the becks as needed. We have meetings every couple of months to catch up on becks business, and there are also lots of opportunities for learning more from the experts.

Town Beck - Back Beck - Wine Beck - Lumb Beck

Riparian Woodlands

Riparian woodlands (or **wooded ghylls**) are characteristic of our Pennine becks. There are several examples in Addingham, most notably Marchup Ghyll, although Marchup and our other ghylls are in places severely degraded

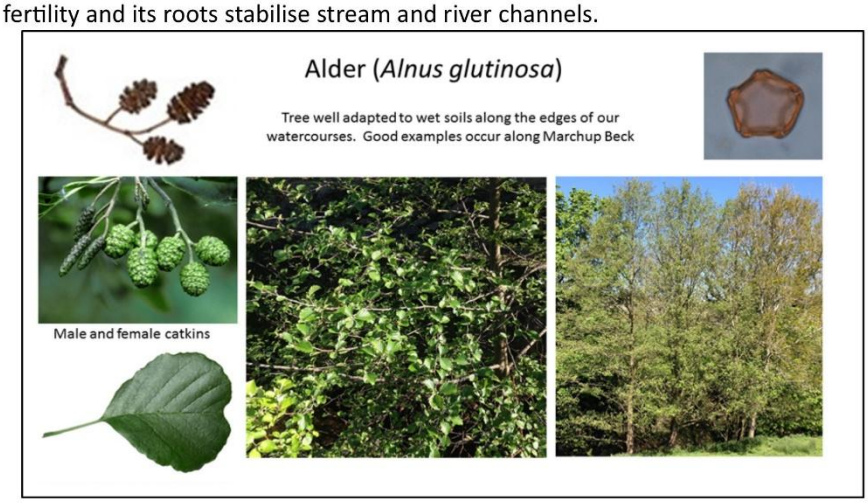
Intact ghylls are very beneficial to the becks and to the wider landscape in several ways:

- They act as **wildlife corridors,** creating links between different habitats and routes along which animals can disperse
- They help to **stabilise the banks** reducing erosion and improving water quality
- Leaf litter **provides food** for invertebrates and fish
- They **provide shelter and shade** helping to control water temperature as global warming increases
- They provide **woody debris**, slowing and deflecting the flow and creating habitats for fish and invertebrates

Marchup Ghyll



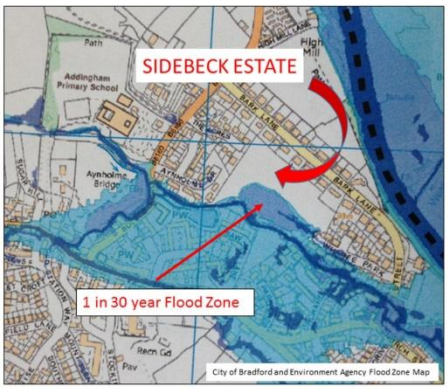
Alder is an especially valuable riparian tree. It fixes nitrogen from the atmosphere thereby improving soil fertility and its roots stabilise stream and river channels.



Flood Zones

. Flood Zones are areas next to watercourses that are subject to flooding
. They allow flood waters to spread out, thereby slowing the flow of water helping to protect areas downstream from flooding
. Areas prone to flooding have been mapped in detail by the Environment Agency allowing developers and planners to identify land to be avoided for building
. As part of the natural flood plain they provide a wide range of habitats for wildlife

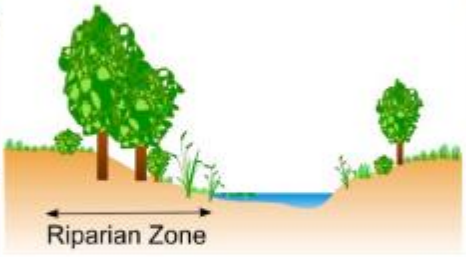
The new Sidebeck estate in Addingham is an excellent example of how developers have respected the area at risk from flooding by protecting the bankside, creating a beck-side wetland and planting a wildflower meadow on the lowest lying land



Beckside Plants

The riparian zone provides many benefits which include:

- Creating habitat for associated species and increasing biodiversity.
- Providing food for fish and aquatic insects
- Protecting banks from erosion
- Providing a green corridor linking fragmented and isolated habitats - which species can move along
- Providing a buffer zone to protect water from nutrient pollution
- Slowing the flow of water during heavy rainfall events
- Providing aesthetic amenity



There is a large variety of plants that live along the banks of our Addingham Becks. Some of the common species are shown here

Golden saxifrage
(*Chrysoplenium oppositifolium*)

Meadowsweet
(*Filipendula ulmaria*)

Pendulous sedge
(*Carex pendula*)

Great willow herb

Kingcup or Marsh marigold
(*Caltha palustris*)

Alder
(*Alnus glutinosa*)

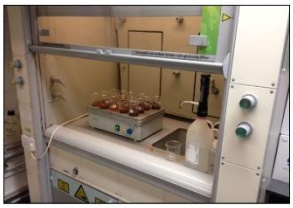
Diatoms

Diatoms and other types of algae grow on stones in our becks. They need nutrients and sunlight to grow.

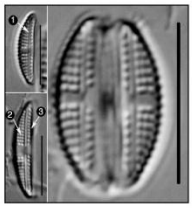
They are extremely abundant and there are many different species providing provide food for insect larvae and other small animals.

To identify them we need to :

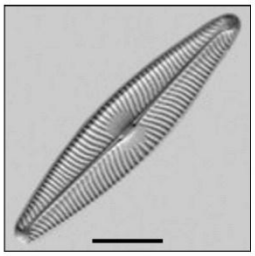
1)brush them off the stones, 2) clean the samples in a laboratory, 3) make glass slides, 4) examine them using a high power microscope

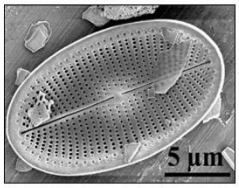
Here are some of the species commonly found in our Addingham Becks



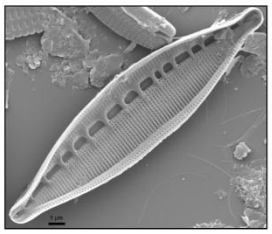
Amphora pediculus. This is the most common diatom found in Town Beck. The left hand picture is taken using a light microscope.



Navicula lanceolata is very common in the more polluted parts of Town Beck. This is a light microscope picture and the diatom is 0.050 mm long.



Cocconeis ***placentula*** is common in Lumb Beck. The picture is taken with a scanning electron microscope.



Nitzschia dissipata. A very distinctive diatom found in our becks This image is taken using an electron microscope

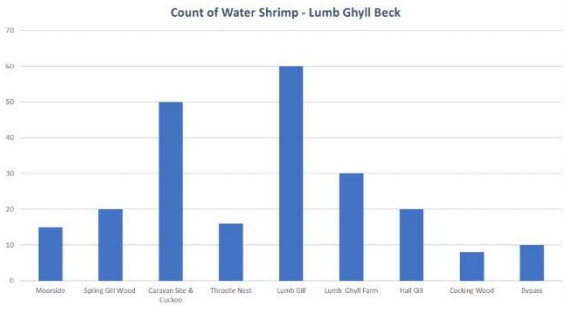
Invertebrates

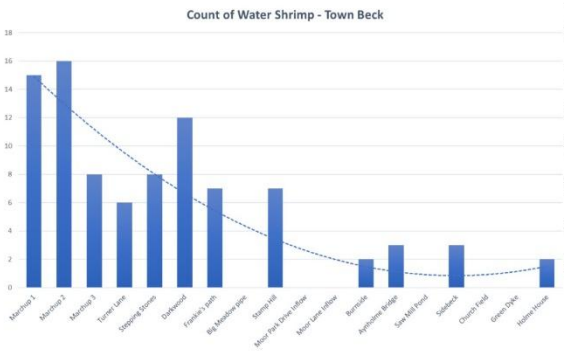
Freshwater invertebrates are an important part of the freshwater ecosystem and food chains. They:

- play a vital role in maintaining the quality of our water
- Breakdown organic matter
- Provide a food source for other species such as fish, birds and mammals
- Can be used to assess the health of our becks

Key issues for invertebrates are

- Pollution such as over-nutrient rich waters
- High levels of sediment
- Lack of habitat diversity
- Engineering activities





Freshwater Shrimp—*Gammarus pulex*

a greyish or brownish freshwater crustacean, upto 11mm long, that prefers slow moving, well oxygenated streams and rivers.

A popular food for birds, fish and some insect larvae so they tend to spend most of the day beneath stones and vegetation.

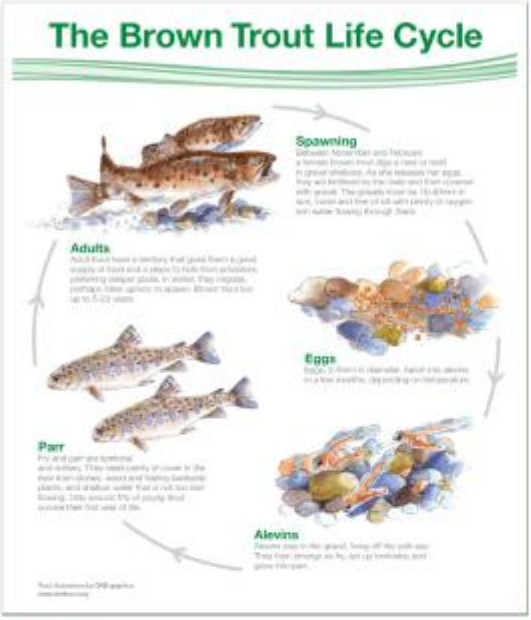
They move around by crawling, but they are also good swimmers. Because of the shape of their body they tend to swim on their sides - hence their other common name of 'sideswimmers'.

In springtime, the males can be seen holding the smaller females as they move through the water. The females carry their eggs inside their bodies in a brood pouch. The eggs hatch in 21 days but the young remain in the pouch until the female moults.

Brown Trout

(*Salmo trutta*)

Brown trout are a fantastic, adaptable fish, they are a key indicator to river health



3 key things to keep trout happy:

- ✓ Water Quantity
- ✓ Water Quality
- ✓ Habitat The two building blocks of habitat are:
  - The river (or lake) and its features such as pools, riffles, glides, banks, meanders, gravels, rocks etc.
  - The plants in the river and on the banks.

Challenges

Water quality—

- excessive nutrients (nitrogen and phosphorous), from diffuse pollution such as agricultural runoff and leaky septic tanks, which can cause algal blooms.
- presence of hormones in treated sewage water that affects the sex of fish.
- too much silt smothers plants, invertebrates and trout eggs.

Water quantity— less water means:

- fewer trout.
- that water warms up more quickly.
- less dilution of pollutants.
- low flows cause silt to be deposited.

Habitat— impact on river habitat includes:

- Dredging and straightening
- Weirs and barriers
- Damage to river banks
- Invasive species

Why are there so few trout in Town Beck?

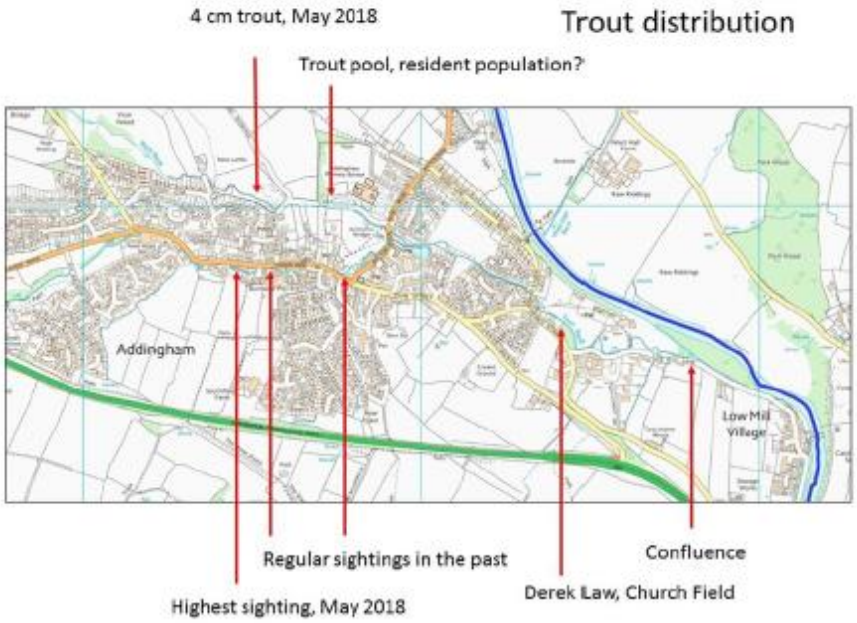
Older residents in Addingham remember seeing large numbers of trout in Town Beck in the past. The Burnside pool next to Main St was an especially good place to see them. They still occur there but in very low numbers.

Derek Law has been monitoring trout and other fish populations in Town Beck for over thirty years. He says "Until 1996 at least 100 brown trout moved from the River Wharfe into the beck each November to spawn..."

What happened in the early 1990s?

The decline in trout numbers coincided with the decline in eels, lampreys and white-clawed crayfish.

We think that the suitability of the beck for fish declined after our large housing estates were built. After heavy rainfall surface water runoff surges into the becks causing channel bed erosion and the destruction of wildlife habitat.



Bird life around the becks

We are fortunate in Addingham in having some lovely becks and a river. Chris Acomb, our village bird recorder, has received reports of 37 different species seen by either our becks, or the river. Some species are clearly water-dependent species, but others are obviously enjoying the environment surrounding the running water.

The best places to see birds associated with water are down Low Mill Lane between the Old Rectory and Low Mill weir and in the middle of the village along the sides of Town Beck near Burnside. Wherever you see birds please send your sightings to Chris at candj.acomb@blueyonder.co.uk

BECKSIDE BIRDS

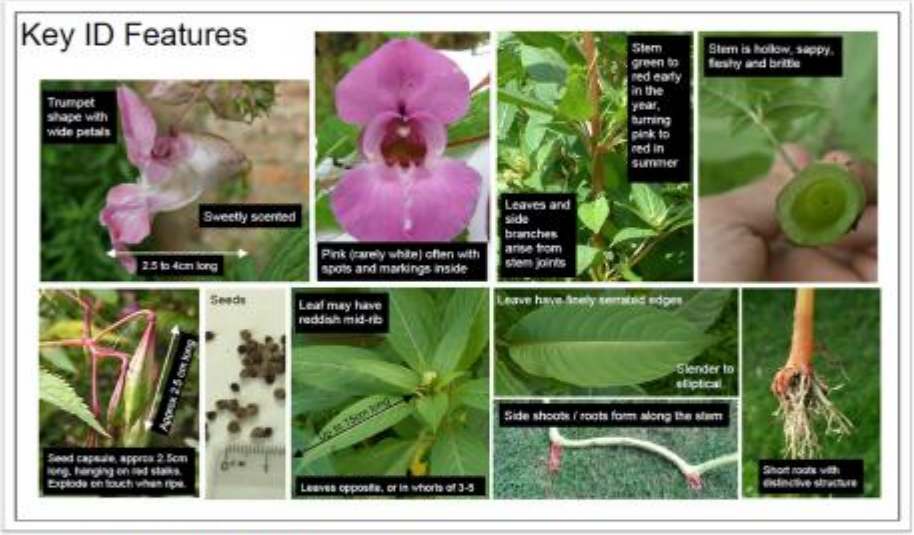
BIRDS IN AND AROUND ADDINGHAM & THE WHARFE

Himalayan Balsam

(*Impatiens glandulifera*)

Native to West and central Himalayas, it is found mostly on river banks and in damp woodland and can grow in other damp habitats.

This annual herb with pink-purple flowers grows up to 2m tall and has explosive seed heads. Each year the plants germinate from the last year's seed, usually Feb/March time. The plants flower from July to October, setting seed from mid-July onwards, in shady areas this can be delayed by 2-3 weeks. After this the plants die back. Most seeds overwinter for one season before germinating the following spring; however, there is some evidence of seedbanks lasting for at least 2 years.



Picture 1. Key identification features for Himalayan balsam www.nonnativespecies.org

How did it get here?: Introduced as a garden plant in the early 19th century and first recorded in the wild in 1855.

Where is it found?: Now widespread in the UK, especially along urban rivers it spreads solely by seeds, which are small and easily carried by wind or water. Each plant ejecting as many as 800 seeds for a distance of up to 7 m!

Why is it a problem? : It out-competes native species , particularly on river banks. Dense stands along river banks can impede flow at times of high rainfall, increasing the likelihood of flooding. Die back of extensive stands over winter can leave river banks bare and exposed to erosion.

Can it be managed/eradicated? : there are various options for managing this species but as it is very wide-spread, eradication is most likely in upstream areas where the stands are not as dense. It can be managed with:

- Hand pulling - labour intensive but targeted. Needs to be done before the seed heads are formed.
- Chemical spraying - requires contractor and consent, but can kill plants in areas that are difficult to access.
- Strimming - ideal for large stands of balsam, cutting must be below first node to be effective.

Information taken from GB Non-native Species Secretariat

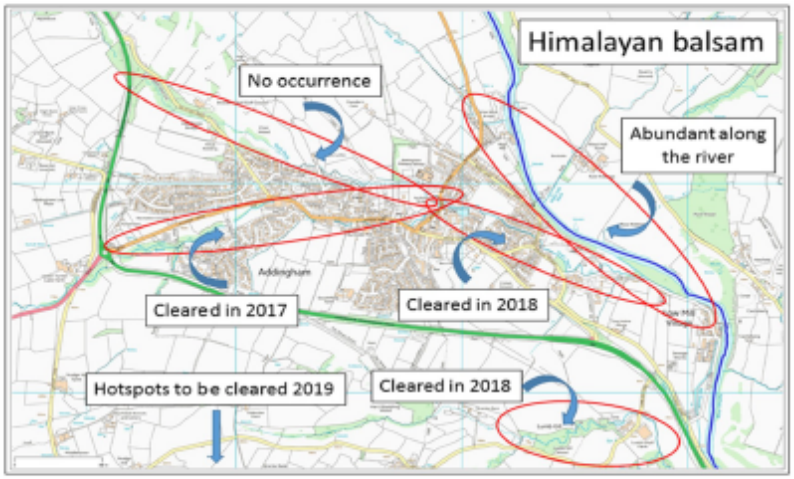
Himalayan Balsam in Addingham

- Himalayan balsam has spread very rapidly along the banks of the Wharfe and along our becks over the last 10 years
- We cleared it from Town Beck down to Aynholme Bridge in 2017 and from the rest of Town Beck in 2018
- With the help of local landowners on the Moorside and the Scouts we started to clear it from Lumb Beck in 2018
- This year we hope to clear it completely from Lumb Beck, targeting several remaining hotspots
- So far we haven't seen it along Back Beck
- It is abundant along the Wharfe and will remain so for many years as seeds continue to be washed down the river
- Pull it out (wearing gloves) when you see it before it sets seed and leave on the ground to decompose

Scouts clearing Himalyan balsam near Cuckoo Nest, 2018 (photo: Rick Battarbee)

Lumb Beck (Cocking Lane, 2017)

What has been done and what is planned?



Town Beck (Burnside, 2017)

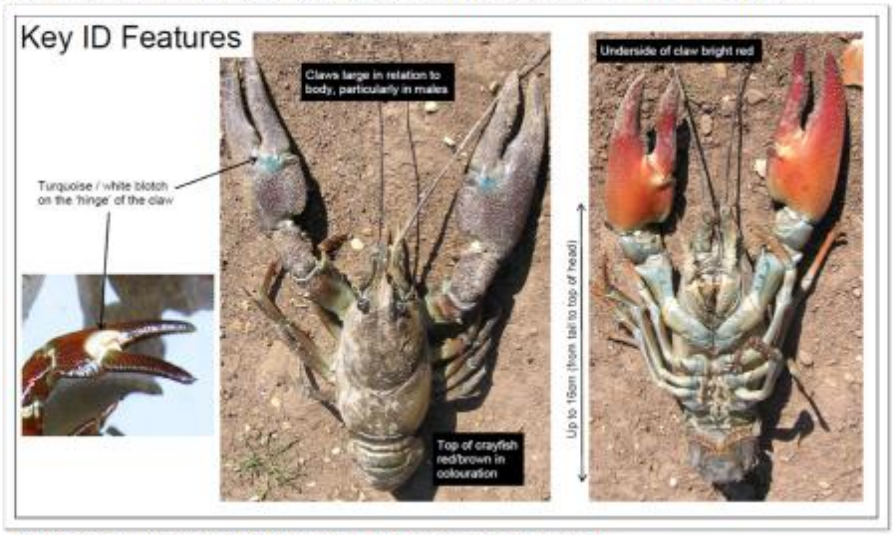
Signal Crayfish

(Pacifastacus leniusculus)

Native to North America this species is found in most freshwater habitats. Their small lobster-like appearance makes crayfish easy to recognise. Compared to the native species, the signal crayfish is much larger and its claws are red underneath with a small turquoise / white blotch on the surface

Signal Crayfish mate in the autumn and females carry the dense clutch of 200-400 eggs on the underside of their tail over the winter. Once hatched, the young remain attached to the females until May-June. The young resemble adults and are able to feed on most animal and plant food.

Signal crayfish are sexually mature at the age of 2-3 years and can live up to 20 years.



Key identification features for a signal crayfish www.nonnativespecies.org, Image from www.nonnativespecies.org

How did it get here? The signal crayfish was introduced to be farmed for food in 1976, but escaped through water courses and across land.

Distribution: now widespread across England and Wales the distribution in Scotland is limited, with populations becoming established at several locations. They are capable of moving both up and downstream and have been recorded to move 341m in two days.

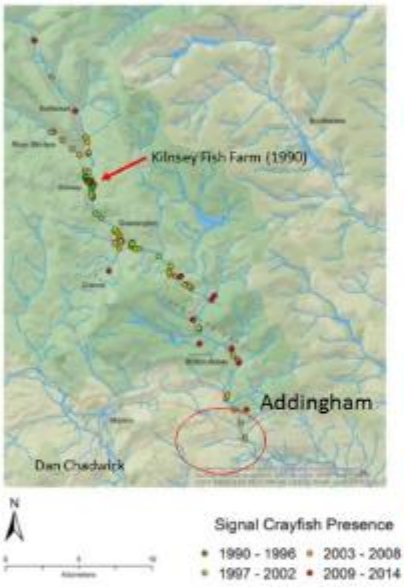
Impact : complete loss of the native crayfish through the spread of disease and direct competition. Also undermines riverbanks through burrowing and can predate on native fish eggs and aquatic invertebrates.

Eradication : No known effective techniques.

Information taken from GB Non-native Species Secretariat

Crayfish in Addingham becks

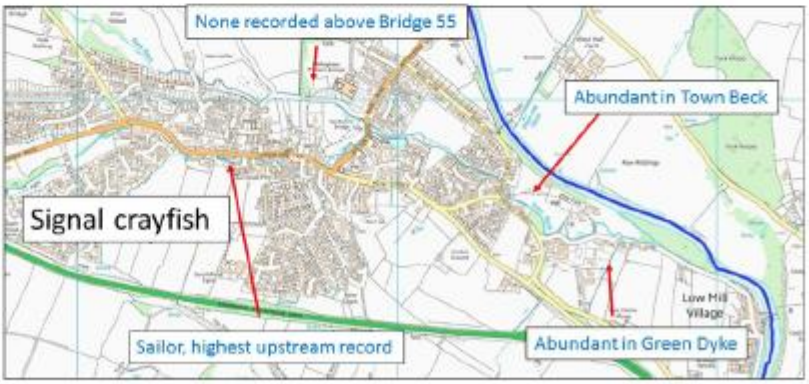
- In the past the native **white-clawed crayfish** (*Austropotamobius pallipes*) was common in Town Beck
- It still occurs in many headwaters in the Dales but no longer occurs in our becks
- It disappeared in the 1990s at more or less the same time as the marked decrease in brown trout populations occurred



- Signal crayfish escaped from Kilnsey Fish farm in 1990 and slowly spread downstream arriving in Town Beck 27 years later
- The first American **signal crayfish** was recorded in 2007 in Town Beck by Derek Law
- They are now abundant in Town Beck and have been seen as far upstream as the Sailor Public House
- If you see crayfish in the beck please let us know with date and location (aeg@addingham.info)
- You must avoid helping the spread of signal crayfish by following biosecurity guidelines
- NB It is illegal to trap crayfish without a license (https://www.gov.uk/guidance/permission-to-trap-crayfish-eels-elvers-salmon-and-sea-trout)

Signal crayfish sightings in Addingham

Signal crayfish, Town Beck 2018
(photo: Rick Battarbee)



Appendix 6. Poster advertising the third drop-in sessions (Task 4)

Appendix 7. Two poster were produced to disseminate information gathered about the project (Task 4).

ADDINGHAM BECKS

Phosphorus

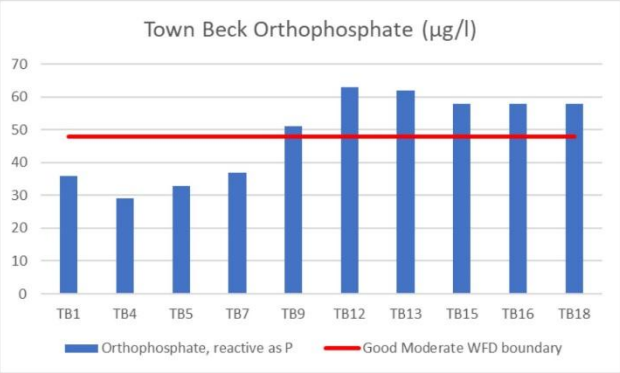
Phosphorus is a key nutrient in river environments, vital for plant growth. However, eutrophication is a major issue in UK rivers, caused by an overabundance of nutrients such as phosphorus.

Water Framework Directive:

The table to the right shows the Water Framework Directive (WFD) standards for phosphorus in rivers. The 4 becks of Addingham are classified as upland (more than 80m above sea level) and high alkalinity (more than 50mg/l alkalinity).

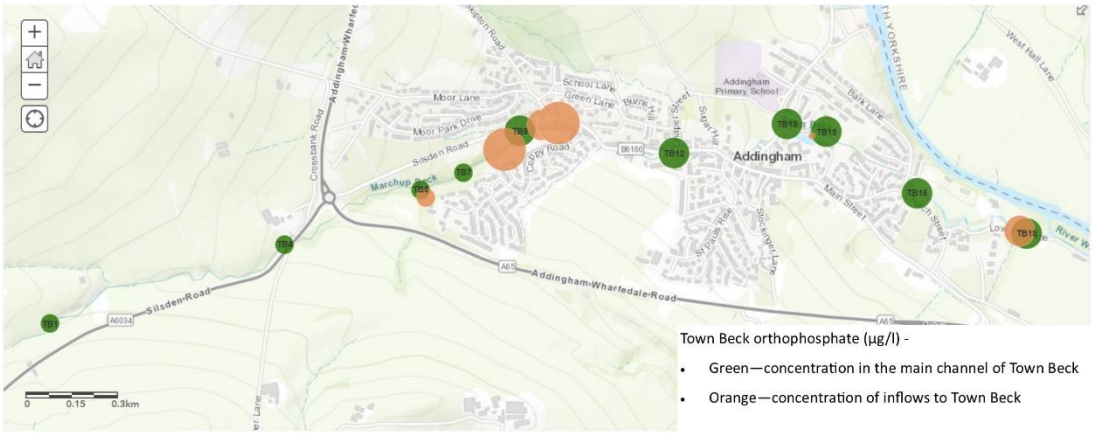
Table 5.1a: Summary of existing and revised standards for phosphorus in rivers

Type (for existing standards)	Annual mean of reactive phosphorus (µg per litre)							
	High		Good		Moderate		Poor	
	Existing	New	Existing	New	Existing	New	Existing	New
Lowland, low alkalinity	30	19 (13-26)	50	40 (28-52)	150	114 (87-140)	500	842 (752-918)
Upland, low alkalinity	20	13 (13-20)	40	28 (28-41)	150	87 (87-117)	500	752 (752-851)
Lowland, high alkalinity	50	36 (27-50)	120	69 (52-91)	250	173 (141-215)	1000	1003 (921-1098)
Upland, high alkalinity	50	24 (18-37)	120	48 (28-70)	250	132 (109-177)	1000	898 (829-1012)



Sources of Phosphorus:

- Fertilizer used on agricultural fields contains nutrients such as phosphorus which can wash off fields in periods of high rainfall and over-land flow.
- Surface water running off from impermeable surfaces in Addingham can also hold high concentrations of phosphorus which enter the becks via drainage pipes.



Town Beck orthophosphate (µg/l) -

- Green—concentration in the main channel of Town Beck
- Orange—concentration of inflows to Town Beck

Invertebrates

Freshwater invertebrates are an important part of the freshwater ecosystem and food chains. They:

- Play a vital role in maintaining the quality of our water
- Breakdown organic matter
- Provide a food source for other species such as fish and birds
- Can be used to assess the health of our becks

Key issues for invertebrates are:

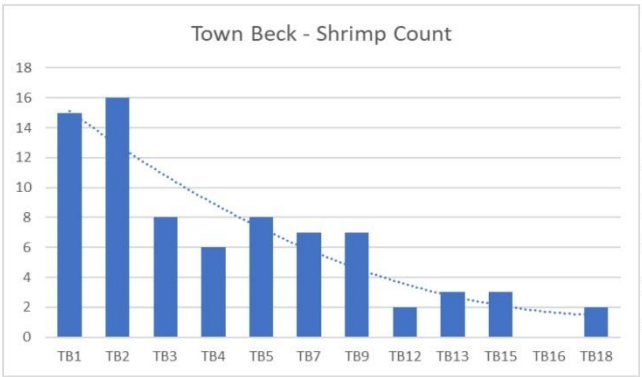
- Pollution such as over-nutrient rich waters
- High levels of sediment
- Lack of habitat diversity
- Engineering activities

Freshwater Shrimp—*Gammarus pulex*

A greyish or brownish freshwater crustacean, up to 11mm long, that prefers slow moving, well oxygenated streams and rivers.

A popular food for birds, fish and some insect larvae so they tend to spend most of the day beneath stones and vegetation.

They move around by crawling, but they are also good swimmers. Because of the shape of their body they tend to swim on their sides - hence their other common name of 'sideswimmers'.
In springtime, the males can be seen holding the smaller females as they move through the water. The females carry their eggs inside their bodies in a brood pouch. The eggs hatch in 21 days but the young remain in the pouch until the female moults.



The population of freshwater shrimp in Town Beck dramatically decreases as the beck changes from an agricultural to an urban catchment. The rapid run-off of water from the impermeable surfaces of the local housing estates causes unnatural pulses of fast-flowing water in the beck that creates unfavourable conditions for freshwater shrimp.

Appendix 8. Beck Steward Handbook (Task 5).

DDINGHAM BECKS

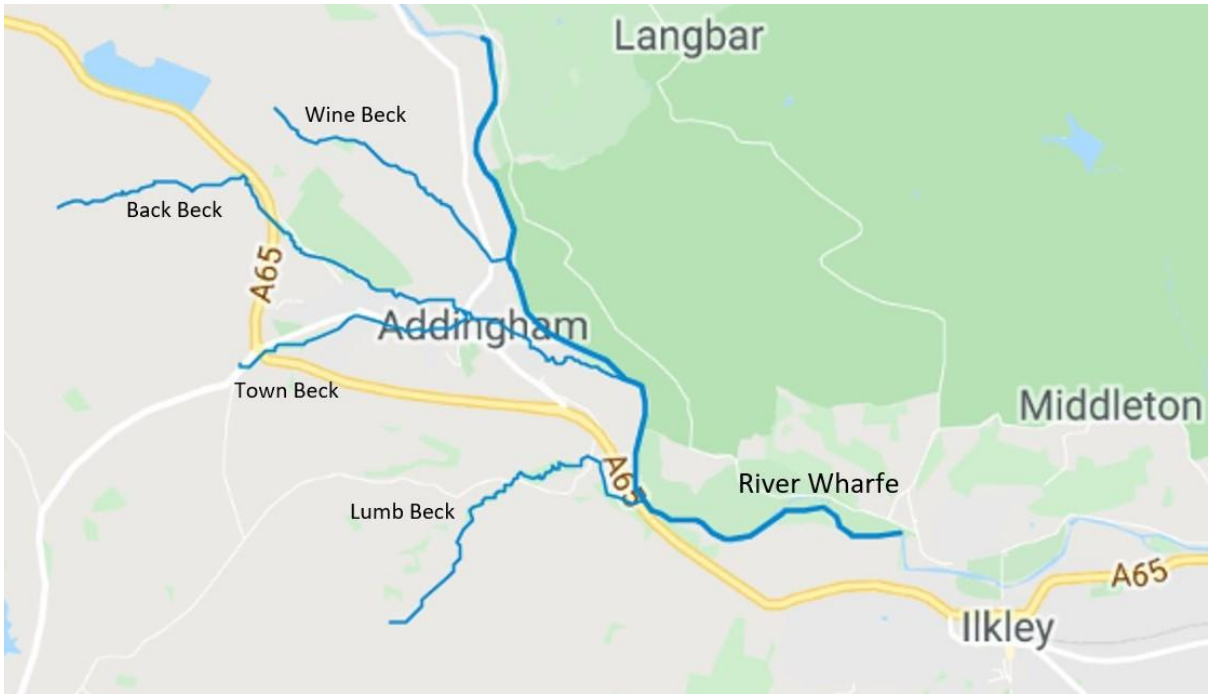
Beck Steward Handbook

Contents

Addingham 4Becks Project: Background

There are four main becks in the parish of Addingham.

- Town Beck
- Back Beck
- Wine Beck
- Lumb Ghyll Beck



Town Beck (that starts as Marchup Ghyll) is joined by Back Beck in the centre of the village and flows into the Wharfe at Low Mill. Town Beck is heavily modified as it passes through the village by the presence of multiple weirs, culverts and drains carrying surface runoff. In contrast Wine beck and Lumb Ghyll Beck flow almost entirely through farmland before joining the Wharfe. These Becks form a sub-catchment of the Wharfe from Barben Beck/River Dibb to Hundwith Beck waterbody within the Wharfe catchment.

The Addingham 4Becks project is focussed around these Becks, as a sub-catchment of the Wharfe. It was set up in the summer of 2017 by Addingham Civic Society's Environment Group and the Dales to Vale Rivers Network, hosted by the Yorkshire Dales Rivers Trust (YDRT). It is a partnership project facilitated by the YDRT and made up of representatives from Bradford Council, the Environment Agency, Yorkshire Water, the Wild Trout Trust, the Addingham Anglers Association, Addingham Parish Council and the Addingham Environment Group.

The Project group has worked together to draw up Objectives for the project and tasks relating to these objectives. The overall objectives are:

Overall Aim

To recognise the place that the four becks (Town Beck, Back Beck, Lumb Gill Beck and Wine Beck) have in Addingham and the wider countryside and to make them a focal point of the village and surrounding countryside with residents understanding their value in terms of habitat, biodiversity, water quality and their role in reducing flood risk.

Objectives

Community engagement

To find out how Addingham residents see the becks and how they would like to see them in the future.

To craft them into village life with the local community making decisions on, and being involved in, positive changes to their management.

To increase the enjoyment of the becks with more people having contact with them and enjoying the contact with nature.

Habitat improvement

To make the becks more natural with more fish, birds and mammals using them and more places for wildlife to live and thrive.

To reduce the presence of invasive non- native species such as Himalayan Balsam and Japanese Knotweed.

Reducing Excess Water

Understanding the impact of recent floods on Addingham by asking who got flooded and where, how high it was and how long it lasted and collating the answers into a record.

Using the records gathered to see what can be done to reduce the amount of excess water in the village, considering natural flood measures (NFM) upstream and Sustainable Urban Drainage Systems (SuDS) in the village to slow the flow of water and reduce the amount of damage.

Water Quality

Finding out what the quality of the water is in the becks with volunteers involved in water sampling and looking at the impact of village life on the becks.

Making the results available to all so that more people understand their impact on the becks and what they can do to improve them

Beck Stewards

Role

As a beck steward you will be part of a group of proactive volunteers, helping to gather information and raise awareness about habitat, biodiversity, flood risk and pollution in the four becks. There are several types of activities which you can choose to be involved with, which will all help to contribute to the Addingham 4 Becks project.

Activities

- Walkover surveys (Structures, Beckside Plants, Birds and Fish)
- Litter Picking
- Balsam Bashing
- Tree Planting
- Leaflet drops

Volunteering frequency will vary throughout the year, there will be something to be involved with at least once a month. See activity calendar on the next page.

What this group is for the beck stewards

- Being out and around the becks and enjoying the flora and fauna
- A practical group, with social benefits
- Getting to know the beck better
- Helping to improve the becks for wildlife and residents
- Celebrating and cherishing the becks
- Working as part of a team
- Local eyes and ears to flag up issues
- Becoming more knowledgeable about wildlife and water

Meetings

Formal meetings will be held quarterly (March, June, September and December) and monthly updates via email.

Training

Every year there will be training opportunities to help refresh your knowledge with identification and carrying out surveys. New beck stewards will have an opportunity to shadow experienced beck stewards.

Activity Calendar

Task	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Meeting												
Bird & Fish Survey												
Beckside Plant Surveys												
Balsam Bashing								*				
Litter Picking												
Tree Planting season												
Organised Walks												
Training												

** There will be annual variation in growth of Himalayan balsam, so it maybe appropriate to be still pulling in August. If seed heads are fully developed and seeds are ready to be dispersed please do not pull, this could increase the risk of spreading the invasive plant to new areas.*

Information and resources

Beckside plant survey

Gathering this information about beckside plants is important, it will help us to see where certain species are found and where we might need to focus on improving the beck, whether that's additional planting or removal of invasive species like Himalayan balsam. Beckside plants provide many benefits which include:

- Creating habitat for associated species and increasing biodiversity.
- Providing food for fish and aquatic insects
- Protecting banks from erosion
- Providing a green corridor linking fragmented and isolated habitats - which species can move along
- Providing a buffer zone to protect water from nutrient pollution
- Slowing the flow of water during heavy rainfall events
- Providing aesthetic amenity

Key native species include:

- Golden saxifrage
- Meadowsweet
- Pendulous sedge
- Great willowherb
- Kingcup or Marsh marigold

These key native plants have been chosen as they are easily identifiable and provide great wildlife benefits.

Key non-native invasive species include:

- Himalayan balsam
- Japanese knotweed
- Giant hogweed

Identification Of beckside plants

Golden saxifrage

(*Chrysoplenium oppositifolium*)

Identification

Opposite-leaved golden saxifrage tends to grow in creeping matts. It has a square stem and blunt-toothed, paired leaves (alternate-leaved golden saxifrage's alternate, as its name suggests). Unlike most saxifrages, it has no petals and only eight stamens.

Habitat

By streams, in boggy woods, on wet mountain ledges. Wet, shady places. This wildflower is fond of acid soil whilst its alternate cousin prefers alkaline ground.

Best time to see

When it flowers March-May.

Meadowsweet

(*Filipendula ulmaria*)

Identification

Meadowsweet displays a 'froth' of creamy-white flowers, densely packed together in flower heads that sit on erect stems. Its dark green leaves are divided into pairs of leaflets and have silvery undersides.

Habitat

By freshwater and in wetlands, grasslands, heathland and moorlands.

Best time to see

When it flowers June-September.

Pendulous sedge

(*Carex pendula*)

Identification

Pendulous Sedge has long, yellowish-green leaves and arching stems that carry the yellow, catkin-like flower spikes, which can be up to 2.5cm long.

Habitat

Found by freshwater and wetlands but also in woodlands, towns and gardens.

Best time to see

You can see it from January to December, but flower spikes appear from May to July.

Great willowherb

(*Epilobium hirsutum*)

Identification

Great Willowherb is a tall plant that is covered in soft, downy hair. Its small, purple-pink flowers have creamy centres, and the lance-shaped leaves sit opposite each other on the stems.

Habitat

Found by freshwater and wetlands but also in towns and gardens.

Best time to see

July to August

Kingcup or Marsh marigold

(*Caltha palustris*)

Identification

Marsh-marigold is a large buttercup-like flower that grows in wet places. It has very large, rounded, scalloped leaves.

Habitat

Found by freshwater and wetlands but also in woodlands, towns and gardens.

Best time to see

March to July.

Himalayan Balsam

(*Impatiens glandulifera*)

Identification

Himalayan Balsam has large, pink flowers shaped like a bonnet; these are followed by hanging, green seed pods.

Habitat

Freshwater, wetlands, woodlands, farmland, grassland towns and gardens.

Best time to see

June to October.

Japanese Knotweed

(*Fallopia japonica*)

Identification

Japanese Knotweed is a very tall plant with large triangular leaves, hollow, red stems that are a bit like bamboo, and small, white, tufty flowers that appear in late summer and autumn.

Habitat

Found by freshwater and wetlands but also in woodlands, towns and gardens.

Best time to see

Can be seen all year round but flowers late summer and autumn

Giant Hogweed

(*Impatiens glandulifera*)

Identification

Giant hogweed is an immensely tall umbellifer (member of the carrot family) that displays large, white, umbrella-like clusters of flowers. Its hollow stem is ridged and purple-spotted, and its leaves are large and divided. Height: up to 5m.

Habitat

Found by freshwater wetlands, woodland, farmland, towns and gardens.

Best time to see

June to August

Warning!! Toxins can cause serious, skin damage.

River Walkover Survey Form

Beckside Plants

When?? Surveys to be carried May, July and September

Surveyor Information		
Name:	Address:	Post Code:
Tel/ Mobile:	Email:	

Details of Survey			
Date Surveyed:	Time:	Beck Name:	

Plant Species:

D-Dominant	**A-Abundant**	**F-Frequent**	**O-Occasional**	**R-Rare**

Plant Abundance									
Site No.	**Great Willowherb**	**Meadowsweet**	**Pendulous sedge**	**Golden Saxifrage**	**Marsh Marigold**	**Himalayan Balsam**	**Giant Hogweed**	**Japanese Knotweed**	**Comments**
TB1									

Plant Abundance									
Site No.	**Great Willowherb**	**Meadowsweet**	**Pendulous sedge**	**Golden Saxifrage**	**Marsh Marigold**	**Himalayan Balsam**	**Giant Hogweed**	**Japanese Knotweed**	**Comments**
TB1									

Bird and Fish survey

Birds and fish are fantastic indicators of how healthy the becks are. The birds selected for this survey are all found in and around rivers, ponds and we would expect to see them in the Addingham 4 becks project area. We have included brown trout within this survey, as its possible to see them when looking into the becks and at certain times of the year nests (Redds) can be visible. These birds and brown trout feed on a wide range of terrestrial and aquatic invertebrates and and require key habitats to thrive. Collecting data on the presence and absence of these key birds and fish will help us monitor the becks health.

Identification of birds

Image RSPB

Kingfishers

Key features – Small (16-17cm), blue and orange

Habitats – Slow moving or sill waters

Food – Invertebrates and fish

Behaviours – These birds fly fast and low over water, and often sit on perches on the side of rivers hunting for fish.

Image RSPB

Heron

Key features – Tall (90-98cm) bird with long legs, grey, white and black

Habitats – garden ponds, lakes and rivers

Food – Mostly fish, but can eat small birds, mammals (voles) and amphibians

Behaviours – These birds can be standing tall looking for food or hunched over with their neck bent over their chest.

Image RSPB

Grey Wagtail

Key features – Small (18-19cm) bird with a long tail, yellow under-tail and grey upper parts.

Habitats – fast-flowing rivers in summer and seen around farmyards and lowland streams in the winter.

Food – invertebrates

Image RSPB

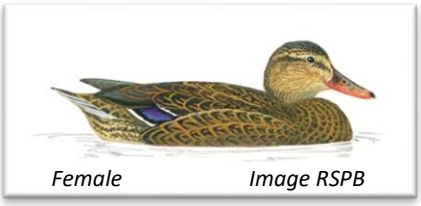
Dipper

Key features – Small (18cm) short tailed, round bird, with a white breast contrasting the rest of its dark plumage

Habitats – fast-flowing rivers in summer and seen around farmyards and lowland streams in the winter.

Food – invertebrates in particular freshwater shrimps

Behaviours – Perches on rocks, bobs up and down and cocks its tail.



Female *Image RSPB*

Male *Image RSPB*

Mallard

Key features –The male has a dark green head, a yellow bill, is mainly purple-brown on the breast and grey on the body. The female is mainly brown with an orange bill. (51-62cm)

Habitats – ponds, rivers and wetlands

Food – Seeds, acorns and berries, plants, insects and shellfish

Image RSPB

Moorhen

Key features –blackish with a red and yellow beak and long, green legs.

Habitats – ponds, lakes, rivers and streams

Food – Aquatic plants, seeds, fruit, grasses, insects, snails, worms and small fish.

Identification of brown trout

Picture 1. Brown trout caught in town beck

Key features – brown trout vary in colour but mainly they appear darker coloured on the top part of the body, fading into a lighter sandy/ silvery underbelly (picture 1). They have several spots along the body, sometimes with lighter halos around them.

Habitats – rivers and streams. Can be found in reservoirs which have access to streams for spawning. Some brown trout will migrate out to sea to feed and return to spawn, these are called sea trout.

Food – invertebrates

Looking for brown trout will be harder than looking for birds, especially when they like to hide in undercut banks, tree roots, rocks and logs. They do this to reduce the risk of being eaten by predators. When they are feeding, they are typically found in the current facing upstream catching invertebrates as they drift by. You might occasionally see them eating invertebrates from the surface of the water. We recommend that you keep a look out but don't spend too long looking for them.

Redd identification

During the spawning season (October – January), when water temperature is low, and water is well oxygenated, perfect for incubating eggs. Brown trout create nests called Redds, these are usually located in areas of gravel and free from silt. The female (hen) creates a depression on the river bed by turning on her side and flexing her body. The hen then lays her eggs and then the male (cock) fish releases his sperm (milt). The hen then moves upstream and covers the fertilised eggs with river bed material.

Picture 2. Original picture (left) and annotated picture, showing a redd.

The redd in picture is easily identifiable, being much lighter colour than the surrounding bed. The darker appearance is due to a fine layer sediment and algae, once this is disturbed, the natural colour of the substrate is exposed. This algae and fine sediment layer can quickly re-accumulate and then it becomes less obvious and trickier to spot.

River Walkover Survey Form

Birds & Fish

When?? Surveys to be carried out monthly all year.

Note Redds will be noticed between Oct to Jan

Surveyor Information		
Name:	Address:	Post Code:
Tel/ Mobile:	Email:	

Details of Survey			
Beck Name:	Site Number:	Weather:	River Level: Flood / High / Normal / Low

	Date		**Date**		**Date**		**Date**		**Date**		**Date**	
	P/A	Number	P/A	Number	P/A	Number	P/A	Number	P/A	Number	P/A	Number
Kingfisher												
Heron												
Grey Wagtail												
Dipper												
Mallards												
Moorhens												
Trout												
Redds												
Additional Observations												

Presence (P) and Absence (A) recording within each map section

Structure Survey

A structures survey has been put together to identify man-made structures (pipes, weirs and culverts) and areas of natural run-off. The locations of these structures and features will be mapped and then the idea is to monitor the quantity and quality of the outfall, and run-off. This will help us identify where sources of pollution are coming from and which pipes or points of natural run-off might be increasing flood risk. This could potentially lead to delivering work to improved water quality and reducing flood risk for Addingham and the four becks.

River Walkover Survey Form

Structures Form

Please use this form to support any information recorded on the map, take a photograph and record the grid reference, whenever possible.

Surveyor Information		
Name:	Address:	Post Code:
Tel/ Mobile:	Email:	

Details of Survey			
Date Surveyed:	Time:	Beck Name:	Site Number
Grid Ref: Start: Finish:	River Level: Flood / High / Normal / Low	Weather:	

Structure Type:

P-Inflow Pipe **N**-Natural Run-off **W**-Weir **C**-Culvert **O**-Other

Issues *Please fill in for every issue observed, mark the location on the map and take a photograph*

Site No.	Feature Code & number	Diameter (Circular) or Width & Height (cm)	Bank Right(R)/Left(L)	Grid Ref	Photo Ref	Comments
TB1	**P1**	**10**	**R**	**SE 07451 49816**	**TBS1_01**	**Running water**

Issues *Please fill in for every issue observed, mark the location on the map and take a photograph*						
Site No.	**Feature Code & number**	**Diameter (Circular) or Width & Height (cm)**	**Bank Right(R)/Left(L)**	**Grid Ref**	**Photo Ref**	**Comments**
TB1	**P1**	**10**	**R**	**SE 07451 49816**	**TBS1_01**	**Running water**

Health and Safety

Risk Assessment	Damage arising to individuals, property or environment as a consequence of undertaking tasks		Date:	**4 Becks Project**
Locations: Becks, surrounding areas and access	Who: Stewards/Volunteers			
Personal Protective Equipment & Safety Equipment Requirements: Rubber boots or equivalent; First aid kit; suitable gloves; Appropriate Litter Picking Tools and Disposal Bags				
Risk Description	Potential Impact	Mitigant	Net Impact H/M/L	(See notes below)
Physical Injury to Steward/ Volunteer	Drowning Concussion Broken Bones Cuts and Grazes Bruises Strains and Muscles	• Work only in pairs • Let someone else know where you are going if possible. • Test water depth before entering. • Only one person enters the water. • Wear suitable clothing clothing. • Use walking poles if climbing banks. • Always wear protective gloves, especially when picking litter or moving obstructions. • Individual knowledge of own competencies and capabilities	Given the nature of the possible activities to be undertaken, there will remain a residual risk of physical injury. Whilst the probability will be reduced significantly and is likely to be low, in the extreme, the injury could be serious.	1

		• Litter picking and disposal guidance • If in any doubt do not undertake the activities		2
	Bites/Stings	• Avoid wasp nests and 'swarming bees' or other insects • Avoid other animals unless they are deemed to be non-aggressive	Given the nature of the activities there will remain a residual risk of injury. Whilst the probability is likely to be low, in the extreme, the injury could be serious.	
	Water Diseases eg Weils	• Education & Training Material	Given the nature of the possible activities to be undertaken, there will remain a residual risk of physical injury. Whilst the probability will be reduced significantly and is likely to be low, in the extreme, the injury could be serious.	3
	Other Diseases –eg Lymes; Cellulitus; Animal excrement transmitted diseases	• Education & Training Material • Wear protective clothing • Clean protective clothing thoroughly after use	Given the nature of the possible activities to be undertaken, there will remain a residual risk of physical injury. Whilst the probability will be reduced significantly and is likely to be low, in the extreme, the injury could be serious.	3

	Weather Exposure	• Avoid extreme weather conditions • Wear suitable clothing	Low residual risk	
	Bio Chemical Exposure	• Education and Training. • Follow education guidelines and wear protective clothing	Given the nature of the possible activities to be undertaken, there will remain a residual risk of physical injury. Whilst the probability will be reduced significantly and is likely to be low, in the extreme, the injury could be serious.	3
Damage/ Loss to Own Property	Cost of repair/replacement	Personal Cost	Low cost of risk	
Physical Injury to 3rd Party	The potential types of injury are similar to those that might be incurred by members of the 4 Becks Project. This would be due to environmental or physical damage caused by the Project	• Apply the mitigants as above • Record and Report all incidents of damage so that corrective action might be taken • Insurance Policies	Low level of Risk. Cost to be covered by Insurance Policies with no individual liability passing to Project Members	6 4
Damage & cost to repair Environment	Cutting down vegetation Disturbing the banks when entering the water Disturbing ' natural material' that shouldn't be moved	• Application of above mitigants • Do not cut vegetation unless required to as part of a specific and planned initiative such as planting	Low level of Risk. Cost to be covered by Insurance Policies with no individual liability passing to Project Members	

	Procedures and guidance are flawed Procedures and guidance are not followed	• Procedures and guidance reviewed and recommended by technical expert where appropriate • Integrity of stewards and volunteers • Record and Report all incidents of damage		
Damage & Cost to repair 3rd party Property	Inadvertent trespass Inadequate Guidance and Process Failure to follow	• Mapping of land ownership to ensure clarity • Obtain landowner consent before each activity • Local Knowledge • Record and Report all incidents and near misses • Insurance Policies	Low Level of Risk. Cost to be covered by Insurance policies with no individual liability passing to Project Members	5
Damage to 4 Becks reputation		• Integrity of stewards and volunteers • Obtain landowner consent before each activity • Use 4 Becks pre prepared material that explains the purpose of the project • Record all incidents and near misses	Low probability of occurrence. That said a high-profile event may well damage the reputation of the Project and Individual Members.	6

Notes

1	Each individual will take responsibility for assessing their own levels of skill, confidence and capability, and also to be prepared to accept the degree of residual risk which will inevitably present even after applying all preventative mitigants
2	Guidance, education and possibly training to be developed
3	This is still to be developed and delivered. General sense is that there is a very low level of awareness of potential diseases and bio hazards and how to safeguard oneself and that this needs to be formalised.
4	A thorough understanding of the Insurance Cover is required to confirm the validity and cover assumed in the risk assessment
5	Responsibility for mapping land ownership to be determined
6	A formal recording system, together with photographic evidence where possible needs to be maintained so that landowners can be notified of damage. This will also support future potential claims against the Project

Training and Volunteer log

Training Log

Date	Training Activity	Time at Training	Comments

Volunteer log

Date	Activity	Time Spent	Location and Beck

Total Time Spent ……

Appendix 9. Water friendly homes leaflet produced for the Addingham community (Task 13).

Appendix 10. SuDS leaflet produced to find locals interested in installing SuDS Addingham community (Task 13)

ADDINGHAM BECKS Can you help us with SuDS?

We are looking for ways to reduce flooding in Addingham and hoping to find a number of homeowners that would consider installing SuDS.

Why have I got this leaflet ?

When the Big Meadow Drive estate was built 30 years or so ago surface water (that is rainwater from roofs, drives and road surfaces), was engineered to run off into Town Beck. We now know that after heavy rainfall rapid runoff increases the risk of flooding and causes problems for life in the beck. One of the solutions is to slow the flow off the Estate using SuDS.

What are SuDS?

Sustainable Drainage Systems (SuDS) are a type of drainage designed to manage surface water runoff, in a more sustainable, natural way than by conventional drainage such as pipes and tanks.

ADDINGHAM CIVIC SOCIETY ENVIRONMENT GROUP

Yorkshire Dales Rivers Trust

ADDINGHAM BECKS

Benefits of SuDS?

Chicken Coop Green Roof

- They reduce the risk of flooding by slowing down surface water-run off and providing storage
- They reduce surface water pollution by treating runoff through natural processes.
- They provide natural habitats for wildlife
- They provide areas of amenity

Examples of SuDS?

- Green Roofs
- Water Butts
- Swales
- Permeable Drives
- Rain Garden

Rain Garden

Permeable Drive

Information and images from ecosure and susdrain www.susdrain.org susdrain

I would like to find out more

Name

Address

Number

Please post to 9 Main Street, Addingham, LS29 0PD
Or Email marie.taylor@ydrt.co.uk